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ABSTRACT

This report describes the process used by the Hammonton (New Jersey) Public School District to develop and implement a plan to integrate computers into the K-12 curriculum. A 5-year plan was developed for the acquisition of hardware and software, a voluntary staff development program was implemented in computer applications, integration and multimedia were provided for teachers in the district, and a community public relations program was designed to disseminate information. Five-year plans were unanimously adopted by the Board of Education for implementation during the 1991-92 school year. Several district initiatives that supported the acquisition of hardware and software included the establishment of a school-business partnership and the creation of an education foundation. All of the teachers participating in the staff development program integrated one or more components of computer applications into the classroom environment. Teacher knowledge, perception, and expectations with regard to computer technology and education improved during the implementation process. Finally, efforts to disseminate information to parents and other members of the community also promoted broad, conceptual understandings of the district's initiatives and resulted in improved public attitudes toward computer integration. Surveys on teacher perceptions of computer technology and other data are presented in eight statistical tables and nine figures. (Contains 33 references.) (Author/KRN)

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The Development and Implementation of a Five-Year Plan for the Integration of Computers Throughout a Total School Curriculum

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A Major Applied Research Project Report
presented in partial fulfillment of the requirements
for the degree of Doctor of Education

Nova University
National Ed.D. Program for Educational Leaders
Wilmington VI Cluster

October 1992

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Abstract

This report describes the process used by a school district to develop and implement a plan to integrate computers into the total K-12 curriculum. A report of the Middle States Association Visiting Committee for Hammonton High School, in November 1986, recommended that the school develop plans for the acquisition, use and integration of computers. The committee also recommended that the school provide an inservice training program for members of the professional staff.

Several causes were identified as contributors to the problem. These included: a lack of appropriate hardware and software, a lack of teacher training and preparation and a lack of vertical articulation in computer utilization from the elementary to the middle to the high schools.

To respond to the problem, a five-year plan for the integration of computers throughout the total school curriculum was developed, a plan was established for the acquisition of hardware and software, a voluntary staff development program was implemented in computer applications, regular staff development programs in computer applications, integration and multimedia were provided for teachers in the district and a community public relations program was designed to disseminate information regarding computers to the public.

As a result of the project interventions, five-year computer integration and staff development plans were unanimously adopted by the Board of Education for implementation during the 1991-1992 school year. Several district initiatives were realized that supported the acquisition of hardware and software and included the establishment of a school-business partnership and the creation of an education foundation. One hundred percent of the teachers participating in a volunteer staff development program integrated one or more components of computer applications into the classroom environment. The outcomes of several project interventions also indicated that teacher knowledge, perception and expectation with regard to computer technology and education improved during the implementation process. Finally, efforts to disseminate information to parents and other members of the community also promoted broad, conceptual understandings of the district's initiatives and resulted in improved public attitudes toward computer integration.

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Chapter 1

Problem Statement and Community Background

General Statement of Problem

A report of the Middle States Association Visiting Committee at Hammonton High School, in November 1986, reflected the discrepancy between what should be and actuality with regard to computer application and integration and recommended that the school develop plans for the acquisition, use and integration of computers throughout the school curriculum and provide an inservice training program for the instructional use of computer technology and infusion of computer technology throughout the curriculum. The Superintendent of Schools also stressed the importance of using computers as a tool for immediate and future application development throughout the curriculum.

Description of Immediate Problem Context

In November 1990, Hammonton High School had 648 students enrolled in grades 9-12. Three hundred and eighty-eight, or 60%, of the students were enrolled in the college preparatory curriculum, while 61% of the students continued their education beyond high school at two or four year colleges. The student population was 87% White, 12% Hispanic, and 1% Black and other minorities. The high school had one sending district. Approximately 40 students a year were sent to Hammonton High School from the Borough of Folsom.

Hammonton High School opened in 1965, as a grade 7-12 comprehensive junior-senior high school with a functional capacity of 948 students. Since the opening of the building, the school evolved into a four-year secondary school with a functional capacity of 786 students. The high school curriculum changed to include an advanced placement and honors track, a college prep curriculum, a regular track and business program, and a general course of study. From 1985-1990, enrollment in the special education program increased while the number of students required to supplement their course of study with basic skills instruction decreased.

During the 1989-1990 school year, students in the State of New Jersey not scoring at specified levels on certain standardized tests had to be given remedial instruction. At Hammonton High School, the decision was made to remediate for full period blocks of time in small group instruction. Overall, this increased the number of available programs for students and decreased the number of classrooms used for other group instruction. The average pupil-teacher ratio for the high school was 18.4 to 1.

The certified professional staff of the high school included 55 teachers (29 male and 26 female), 4 department chairpersons (1 male and 3 female), 4 guidance counselors (2 male and 2 female), 1 guidance director (female), 1 vice-principal (male) and 1 principal (male). The project manager was the high school vice-principal whose duties included, but were not limited to, the daily operation of the school. The certified staff did not represent the percentages of the student population. One hundred percent of the certified high school staff was White.

In August 1989, a decision was made by the project manager, with input from selected staff, to purchase 18 new I.B.M. Model 30-286 personal computers and to relocate and redesign the computer room. The Model 30-286 computer was chosen because of its MS-DOS standard. It was chosen over the I.B.M. Model 25 because of its expansion slots, hard disk, component parts, and better networking capability. In addition, the 286 processing chip was considered a more advanced and better chip by I.B.M. and would provide longevity, despite changes in technology.

A final consideration deserves mention. The component parts of the Model 30-286 lent themselves to better technical maintenance. While parts due to breakdown could be sent or delivered for service or detached for on-site maintenance, a substitute component could be attached during the interim, thus reducing down time. Also, the Model 30-286 allowed consideration for student visibility since the component parts could be housed under the computer table. The computer tables at Hammonton High School were designed by the maintenance department, after consultation with the project manager, in order to provide this capability and enhance student auditory and visual considerations.

The project manager had the authority to make these decisions based upon his experience with a prior management plan and his familiarity with the I.B.M. system and representatives. In June 1988, the project manager was delegated a management plan by the Superintendent of Schools to develop a five-year computer system for the purpose of student administration for the entire school district. Everyone within the district with a responsibility for student management or administration was included. A study from July 1988, to April 1989, resulted in a $500,000.00 I.B.M. district networked system to be implemented in phases over a period of five years. Since that time, two appendices were added to the plan.

The first appendix to the management plan redirected the emulation (a connection of multiple computers to a larger mainframe computer which then serves as an entryway into the larger computer) of the guidance departments at all three schools from the 1989-1990 school year to the 1990-1991 school year. Also, during the 1990-1991 school year, the original management plan provided financial support for $50,000.00 in network mainframe conversion to an I.B.M. AS-400 system. It was felt that although the original I.B.M. System 36 still had one remaining expansion of memory and could accommodate any new district emulations, cost analysis justified the purchase of the AS-400. In meeting with I.B.M. representatives in April 1990, an error was revealed in the original quote for the AS-400 system. Instead of the original $50,000.00 figure, the total conversion price changed to $110,000.00. A second appendice was augmented to the plan. The AS-400 system was purchased during the 1991-1992 school year.

A computer room was the first phase of another three-year redesign for the high school. Eighteen I.B.M. Model 30-286 personal computers with color graphics were purchased and placed into a redesigned classroom dedicated for computers. Peripheral purchases included four I.B.M. Quietwriter II printers, cables and switch boxes allowing four or five computers to utilize a designated printer on a first come first serve basis. In addition, the classroom was air conditioned to accommodate the increased operating temperature of the room, the chalkboards were removed to eliminate dust particles damaging the disk drives of the computers and a television monitor, VCR, cable, and overhead projector were installed to allow for supplementary forms of instruction.

In preparation for the second year of the project (1990-1991), the 18 computers were networked in June 1990, with an I.B.M. Model 80 personal computer dedicated as the file server (a larger, capacity computer holding the software for a number of networked computers). An additional 10 I.B.M. Model 30-286 computers with color graphics were purchased, placed into the media center and networked into the system before the start of the school year.

LAN (Local Area network) software, purchased in addition to the I.B.M. Novell (maintenance) and ICLAS (communication) systems, included Word Perfect 5.1, d-Base 4, and Lotus 1-2-3. Additional software was also included for a newly developed PASCAL course in the mathematics department and a revised accounting course in the business department. The three application programs formed the curriculum for the computer applications course developed during the introductory practicum experience. Word Perfect 5.1 was also utilized in a newly developed word processing course in the business department.

Sixteen I.B.M. Model 30-286 computers in the architectural drafting room were networked into the system during the 1990-1991 school year. These computers were purchased with matching funds from a State of New Jersey vocational grant and the local district. Software for these computers was contained in each computer, although each computer had the capacity to access other software from the file server.

During the third year of the project (1991-1992), a second classroom of 18 identical computers was networked into the system. At this time, the file server (I.B.M. Model 80) was placed into an adjoining classroom with access to both computer rooms. In addition, the mainframe for the student administration system was replaced with an I.B.M. AS-400 and was relocated to this classroom, enlarging the work area of the district data entry technician and allowing her the opportunity to provide assistance as necessary. Although both the administrative and high school curriculum mainframe systems were housed in the same classroom, they remained separate and distinct.

Description of Surrounding Community

In November 1990, the Hammonton Public School System consisted of the Hammonton Elementary School, which served 842 students in grades K-5, the Hammonton Middle School, which served 426 students in the sixth, seventh and eighth grades and the Hammonton High School.

Based upon data from the Hammonton School District Master Plan, the elementary school, which opened in 1975, had a functional capacity of 1,247 students. Class sizes averaged approximately 23 students per teacher. Supplemental instructional activities, basic skills instruction and English as a Second Language averaged much smaller class sizes.

School personnel included an administrative team of the principal and vice-principal, 1 reading supervisor, 1 1/2 guidance counselors, 54 teachers, 8 funded specialists and 9 teacher's aides. In addition, the district's offices for the Child Study Team and Superintendent of Schools were located in the elementary school.

The middle school was built in 1926, and served as the original high school until 1965. At one time, it housed the entire K-12 school population. The building had a functional capacity of 518 students. Average pupil-teacher ratio for the entire middle school approximated 19.0 to 1. The school administration included the building principal and a shared time administrative disciplinarian and teacher. One and one-half guidance counselors assisted the principal with some administrative functions. Thirty-four teachers were employed at the middle school.

The Hammonton School District was headed by the Superintendent of Schools. Six district supervisors were located throughout the elementary school building and worked in conjunction with the Superintendent's office. Central office supervisors included a District Supervisor for Curriculum and Instruction, a Supervisor for State and Federal programs, and three K-12 subject area supervisors. The Supervisor of Special Programs and the Child Study Team were also located in the elementary school.

In November 1990, the local Board of Education consisted of nine members, three of which were elected annually by the voting public to serve three-year terms. Board of Education members were unpaid in New Jersey and met the petition requirements of American citizenship, 18 years of age, registered as voters, and residents of the municipality for at least one year. At the time of the project, the Board of Education was comprised of seven males, all white and two females, also white. The occupations of the members were reflective of the community, ranging from a business manager and college administrator to a retired farmer.

Hammonton, New Jersey, is a small Atlantic County, agricultural community located equally 30 miles from Philadelphia, Pennsylvania, and Atlantic City, New Jersey. It is the only "Town" in Atlantic County and one of only a very few in the state. The town is served by five major highway systems including the White Horse Pike (U.S. 30), Route 54, Route 206, the Atlantic City Expressway, and the Black Horse Pike (U.S. 322).

Hammonton has a total area of 40.5 square miles. Approximately three square miles, or 7.5% of the town, is taken up by compact, concentrated development. Eleven square miles, or 27%, is completely undeveloped and forms part of the Wharton State Forest. The remaining 65.5% of the town is represented by a mixture of agricultural land, scattered commercial sites, and residential dwellings.

The town is located entirely within the New Jersey Pinelands. The major control of growth has been the restrictions placed upon development and building by the Pinelands Preservation Act. The purpose is to protect one of the country's most important natural resources and water supplies, the Cohansey Aquifer. This major water supply supports the New York, Pennsylvania and New Jersey tri-state area.

According to data developed by the 1980 census, Hammonton had a population of 12,298 persons. Approximately 88% of the population was found to be White, 9% Hispanic, and 3% Black and other minorities. Reports made by the Atlantic County

Office of Economic Development indicated that Hammonton had a population of 14,814 when the results of the 1990 census appeared. The slow rate of growth was directly related to the restrictions previously stated. Population ratios for the town correlated with those of the school district.

About 19% of the families in Hammonton had incomes below the state poverty level. Thirteen percent of the families spoke Spanish as the principal language in the home. Although the number of people employed by the agricultural industry had declined, Hammonton was still known as the "Blueberry Capital of the World" and devoted over 13,000 acres of land to this development. Diversified businesses and industries dealing with clothing and pharmaceuticals provided a significant portion of the economic base for Hammonton.

The rise of casino gambling from 1980-1990 in Atlantic City had an impact on Hammonton; almost 23% of the students who attended Hammonton High School had parents employed by the casino industry. The 11 Atlantic City casinos, with an excess of 64,000 direct and ancillary employment opportunities, will have a future impact on this percentage. In June 1989, the Philadelphia-Atlantic City metro, or the "Gambler's Express," began operation. A major stop on the express was located in Hammonton. It was estimated that a train either stopped or passed through Hammonton once every hour during a 24 hour period, making transportation to and from Atlantic City a relatively faster, more efficient process.

Regional and National Contexts of Problem

According to a survey conducted at Johns Hopkins University and cited in the New York Times (August 9, 1989), approximately 2.25 million computers, or one for every 20 students, were utilized in the elementary and secondary schools of the United States. An average high school had 34 computers. At an average cost of about $1,000.00, each high school had placed a sizeable investment of over $37,000.00 into computers. This same amount was well over $50,000.00 when peripherals were included. The findings of the survey also indicated that more time was spent on teaching keyboarding and programming instructions into the computer than to using computers for applications or new ways of enhancing instruction.

Moursund (1986) focused on the increasing national concern of computer integration emphasis in The Practitioner: National Association of Secondary School Principals. According to Moursund, computer curricula should appropriately and completely integrate the computer-as-tool across the curriculum. Few, if any, schools accomplished this task. He referred to this integration of computer applications as "Computer-Integrated Instruction." As the most important component of computer education, Moursund indicated it represented the major trend that would have the most profound effect on education.

The problems of staff development in computer applications and the integration throughout the curriculum were of concern to high schools in the Southern New Jersey area. Twelve high schools, within 40 miles of Hammonton, initiated staff development programs in computer technology from 1988-1990. Ten of the twelve high schools initiated staff development in computer applications during that time.

With regard to the integration of computers throughout the curriculum, not one of the twelve high schools achieved complete integration. However, two high schools were beginning to integrate, were committed to complete integration, and hoped to achieve complete integration over a five to six year period of time. Of the ten remaining high schools, all utilized computers, but no discernable plan existed to develop integration.

Chapter 2

Problem Definition and Evidence

Problem Background

Until the purchase of the I.B.M. Model 30-286 computers in 1989, and the redesign of the computer lab, the purpose of instruction in the Hammonton School District had remained constant: to develop and expand a fundamental knowledge of computer programming. The computer opportunities offered concentrated on programming with the BASIC language and were designed to fill the needs of students in the college preparatory curriculum. As the State of New Jersey had no graduation requirement for computer literacy or education and provided no direction for implementation, the knowledge and skills developed through programming constituted the Hammonton High School approach to this experience.

According to Becker (1984), the first reflection or view on computer literacy formulated in the early to mid 1970's. It focused on the history of computers, terminology and programming. Many educational institutions, including Hammonton High School, jumped on the computer bandwagon. However, just as technological advancements had markedly changed computers since that time, views on what constituted computer literacy and education also changed. According to Moursund (1986), computer programming instruction no longer satisfied a computer literacy requirement. Programming treated computer literacy as a self-contained course without encouraging computer or related instruction integrated into other areas. Moursund stated that computer education emphasis should focus on articulation and integration of applications throughout the total school curriculum.

In agreement, Neudecker (1989) stated that the student should view a computer as a tool rather than a taskmaster. The purpose of a computer system was to be functional; functionality helped a student complete tasks. Neudecker indicated that software offerings had changed dramatically and had provided options that could be fully integrated and simulated within the instructional environment. With the evolution of application programs also requiring the ability to think critically and solve problems, the basic instructional goal was to teach the skills of word processing (typing, editing, proofing and printing a document), spreadsheet analysis (labeling, valuing, calculating and graphing integrated data), database management (recording, filing and retrieving appropriate information), presentation graphics (creating and displaying the relationships of information visually) and telecommunications (contacting and linking to an outside source for data). These skills equipped each student with the tools necessary for both the workplace and a variety of educational pursuits. Neudecker (1989) referred to the mastery of these skills as "applications literacy."

The introduction of computers into the Hammonton High

School educational program had not followed a systematic or judicious process. Although it was difficult to keep abreast of all the latest developments in hardware, software and curriculum, it was important for the computer program to grow and grasp the full implications of research. As a result of the introductory practicum experience, the project manager guided the development of a computer applications curriculum. It replaced the BASIC programming curriculum in the computer studies area. The focus of the curriculum included three areas: word processing; spreadsheet analysis; and database management. The course was designed to provide students with the necessary higher cognitive application skills for computer productivity. It was also designed to be practical and provide transfer and carry-over skills into other areas of the school curriculum. It was anticipated that the curriculum would become the primary tool in the integration of computers throughout the total school curriculum.

Just as the computer studies area had not followed a systematic or judicious process, the staff development plan for faculty orientation and implementation of computers as a tool had not received priority. From 1987-1990, not one staff development program addressed teacher application and integration of computers throughout the curriculum. The teachers who expressed an interest in, or had knowledge of, computers developed their skills individually and outside of the school setting.

The Hammonton School District's curricular and financial emphasis for staff development had been primarily in two areas: on improving test scores on the reading, writing and mathematics components of the New Jersey High School Proficiency Test; and on implementing the "Effective Teaching" strategies proposed by Madeline Hunter. Although staff development programs were conducted for the entire faculty on stress management, time management, student motivation, student achievement, student self-concept, child abuse and substance abuse, none received the same concentration of time, money and resources.

Students must pass all three sections of the High School Proficiency Test (HSPT) in order to graduate from high school and earn a state endorsed diploma. According to state monitoring procedures, 75% of the students in the ninth grade class must pass all three components. During the 1984-1985 school year, the first year of the HSPT, 53% of the ninth grade students passed all three components of the test. Seventy-one percent passed all three sections during the 1985-1986 school year. As a result, financial and curricular emphasis in the English and mathematics departments concentrated on score improvement. In addition, writing components were infused into every curricular area in order to promote and improve these skills. Intensive staff development also was directed at this effort.

Apple IIe computers were purchased with Chapter 1 funds but could only be used for reading, writing and mathematics remediation in the lower track courses. In addition, all remediation teachers were granted time and expenses to attend staff development workshops and conferences on instructional and promotional strategies, and concerted efforts were made to align the various curricula with the test.

As a result of this emphasis, a district three-year goal was attained by raising the passing scores on all three sections for the total ninth grade class from 71% to 96%. This attainment, however, had impact on the remainder of the total school curriculum.

Staff development in the "Effective Teaching" strategies also received emphasis during the three-year period. The purpose of the staff development process was twofold: to unify an instructional approach; and to identify for teachers a sequence of skills and strategies that increased the probability for student learning. It also systemized a formal observation process for the evaluation of instruction. Each administrator and teacher received training, either through a summer intensive program, or at intervals during the school year. Although the summer program received more favorable comments (and teachers were paid a stipend for attendance), the implementation of the "Effective Teaching" strategies permeated the school curriculum.

After the redesign of the current computer lab, an after-school and voluntary program on an introduction to computer programs was held. For one hour a week from September 1989, through November 1989, 14 staff members performed a variety of introductory tutorial programs on the I.B.M. computers. The program was taught by the mathematics and BASIC programming instructor at Hammonton High School. However, informal questioning of the teachers by the project manager indicated overall disappointment with the program. Only a one-hour word processing introduction, conducted by a business education teacher, received favorable comments. Although the teachers reported a very slight decrease in "technophobia," the results of the program indicated continued apprehension, confusion, and tension with regard to computers.

Evidence of Problem Discrepancy

The project manager first became aware of a problem in the staff development and computer studies area after informal teacher response indicated disappointment with the voluntary and after-school introduction to computers program for teachers in December 1989. Although the introductory program was designed to provide a non-threatening computer environment for teachers, 10 of the 11 high school teachers enrolled in the program expressed continued fear and tension with regard to computer technology. In addition, all 11 indicated that they felt no knowledge increase in regard to computers as a result of participation in the program. The main problem expressed, although difficult to exactly determine through informal questioning, may have been due to the overexpectations of the teachers and the lack of organization on the part of the instructor. The teachers expressed disappointment with the constant reliance upon the tutorial format, with little or no transfer of knowledge beyond the immediate classroom. Additionally, no apparent organization or direction existed in the staff development sessions. As a response to the feedback, a questionnaire was developed by the project manager and distributed to all teachers at the high school regarding their experience, interest and perceptions about expectations and outcomes of computer technology and education. Table 1 shows the results of the questionnaire.

Table 1

Teacher Responses Regarding Experience, Interest and Educational Perceptions of Computer Technology, February, 1990

Questions		Teachers (N=58)	
		% Yes	% No
1.	Do you have any experience working with a computer?	34	66
2.	Do you have any knowledge of computer applications?	31	69
3.	Do you feel uncomfortable with regard to computers and their technology?	60	40
4.	Have you ever used computers either for or in your classroom?	26	74
5.	Do you feel that computers are important enough to warrant consideration for use in the classroom?	83	17
6.	Do you feel that computers could contribute educationally in your classroom?	86	14
7.	If a computer were available in your classroom, would you know how to use it?	31	69
8.	Would you like to know more about computer use and applications for your classroom?	91	9
9.	Would you like to see some staff inservice time delegated to computer use and applications?	91	9

Based upon informal conversations with the 26%, or 15, teachers utilizing computers in the classroom (Question 4), most teachers did so for the purpose of classroom management. Eight teachers (three in the business department, four in the math department, and one in the social studies department) maintained student records and calculated grades with computers, while 11 teachers (four in the business department, two in the English department, two in the fine and practical arts department, and one each in the math and science departments) utilized word processing or database management for the creation of student learning activities and evaluation instruments. Only four teachers (two each in the English and math departments) utilized computers in the classroom, all in the basic skills improvement area and all through tutorial (drill and practice) or computer-assisted learning packages.

According to Neudecker (1989), these results indicated a need for staff development in application and specific domain processes (the specific importance of the computer to each curriculum area) and in their integration throughout the total school curriculum. Although the majority of the teachers indicated an uncomfortable association with computers, 86% felt that computers were important enough and, educationally, could contribute in the classroom. To the project manager, this indication was important.

Despite the overall lack of knowledge and experience with computer technology, teachers realized the contributions and benefits of computers for the classroom. Confirmation occurred when 91% of the teachers indicated that they would like to learn more about computer use and applications and would like to see more staff inservice time delegated to this development. This last report was in agreement with David and Rafi (1984) that, in most cases, teachers are not prepared for computer technology and its implementation in schools. It also confirmed that teacher training was one of the most important and essential aspects that must be addressed. The finding was also in agreement with Diem (1984), who stated that teachers appreciated the role of technology and wanted to overcome their lack of understanding.

Departmental results of the questionnaire also deserved mention. Fifty percent of the teachers indicating experience working with a computer were in either the business (BUS) or mathematics (MATH) departments. Thirty-three percent of the science (SCI) teachers and 30% of the English (ENG) and fine, practical and industrial arts (FPA) teachers indicated experience working with a computer. However, only 17% of the social studies (SOCS) and 14% of the health and physical education (HPE) teachers indicated experience working with a computer, while no teachers in the foreign language (FORL) or special education (SPED) departments expressed a computer background (see Figure 1).

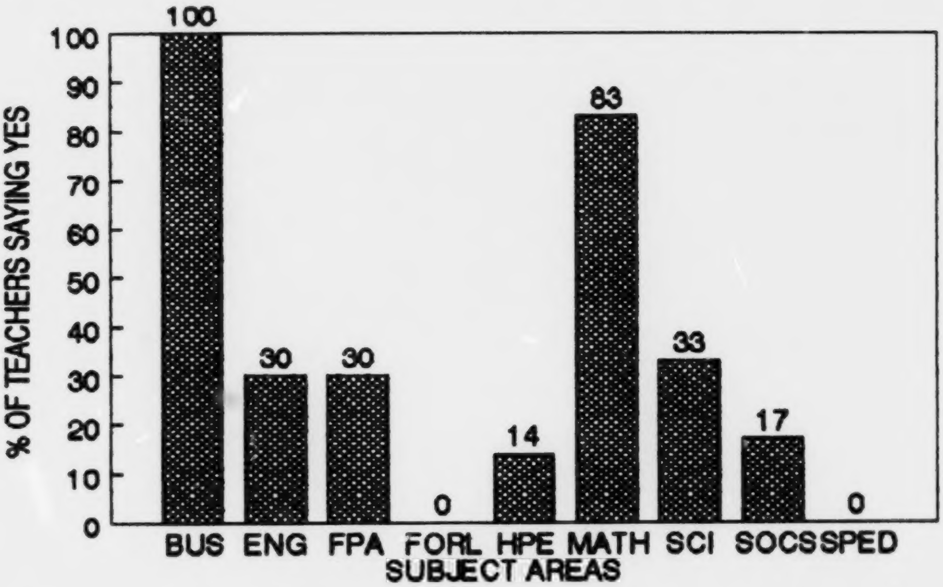

Figure 1. Do you have experience working with a computer?

Fifty percent of the teachers indicating a knowledge of computer applications were also in either the business or mathematics departments (See Figure 2).

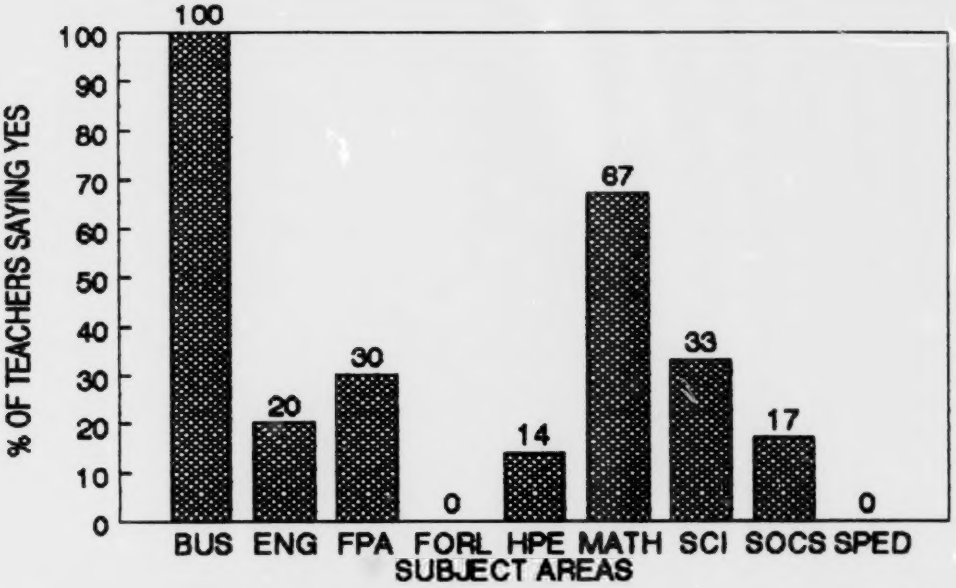

Figure 2. Do you have knowledge of computer applications?

Not surprisingly, neither the business nor mathematics departments had a teacher who indicated having an uncomfortable feeling with computers (See Figure 3).

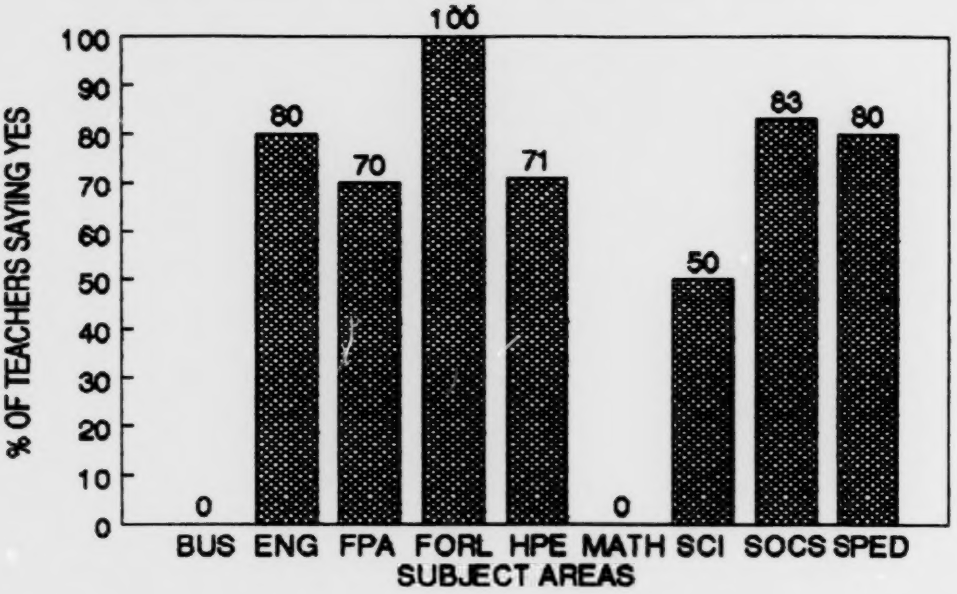

Figure 3. Do you have uncomfortable feelings with computer knowledge?

As seen in Figure 3, the business and mathematics subject areas were the only departments at the high school without any apparent aversion to computer technology. Together, the business and mathematics departments had over 50% of the teachers who indicated computer utilization either for classroom management or student learning activities (See Figure 4).

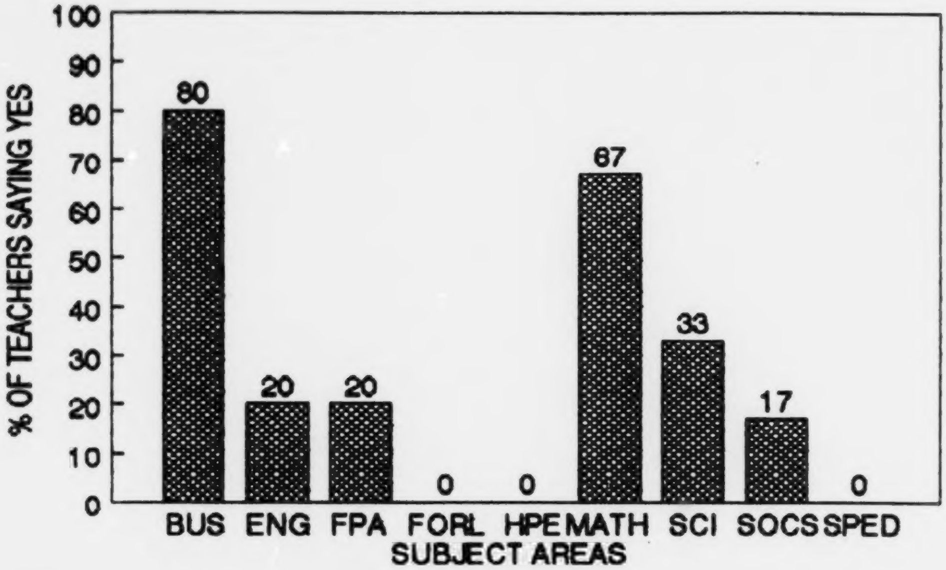

Figure 4. Do you utilize computers for or in your classroom?

Perhaps the assurance with computers exhibited by members of the business and mathematics departments was attributed to the volume of staff development each teacher received during the introductory practicum experience. Both departments indicated the highest percentage of knowledge, experience and utilization and lowest percentages of uncomfortable feelings for the entire school on the questionnaire. This finding was not surprising. Traditionally, all computer emphasis at Hammonton High School had centered primarily upon the mathematics and business departments. It was also interesting that the teachers in both departments had learned and refined their computer skills, not from staff development, but from individual initiative.

Figure 5 defined a realistic estimate of the parameters for staff development and the capabilities for applying computers throughout the curriculum.

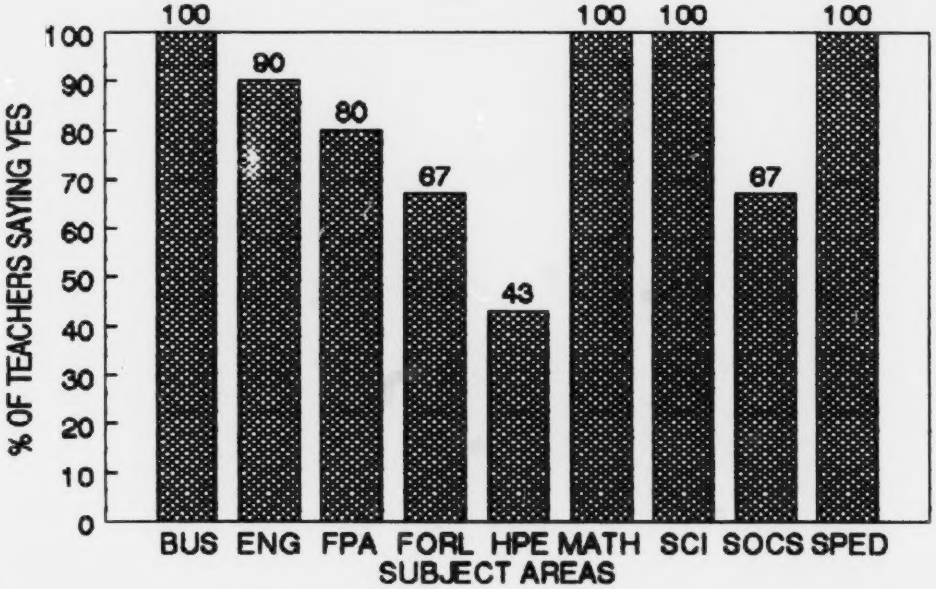

Figure 5. Do computers warrant consideration in the classroom?

Four departmental areas (business, math, science, and special education) understood the educational importance that computers brought to the classroom. Each department had 100% of the teachers who indicated the importance of computers. Three departments had less than 80% of its members (foreign language, health and physical education, and social studies) indicate the importance of computers in the classroom. It was the conclusion of the writer, based on informal conversations, that these feelings were the result of the older ages of members in these departments. The staff members indicating unimportance were at or near retirement age and had little reason to change.

Five departmental areas (foreign language, math, science, and special education) also had an understanding of the educational contributions that computers potentially brought to the classroom. Each department had 100% of its teachers who indicated positive contributions. These results can be seen in Figure 6.

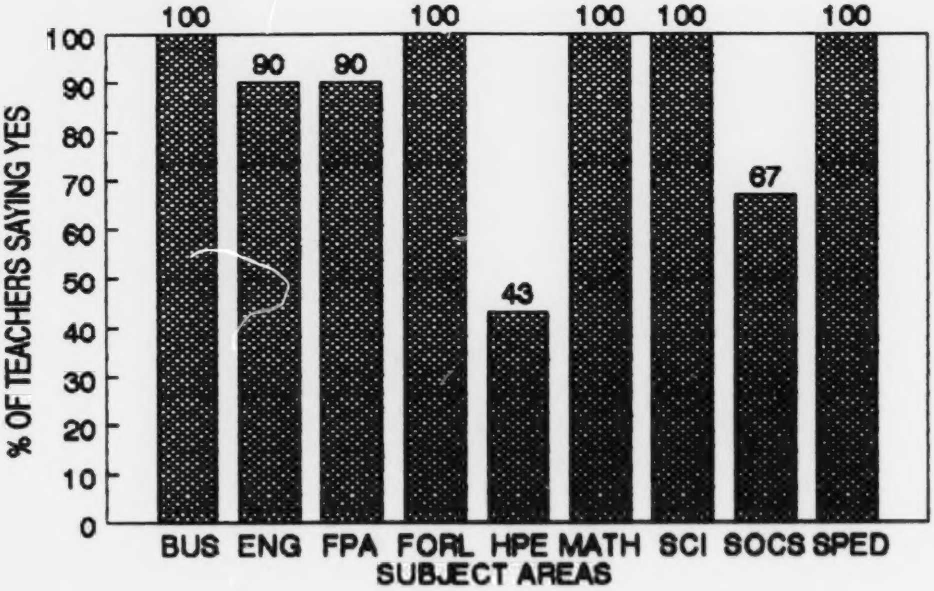

Figure 6. Could computers contribute to your classroom?

Only the health and physical education department had less than two-thirds of its members indicate potential contributions of computers in the classroom. It was also the conclusion of the writer that the ages, and overall disengagement, of the members of the department influenced these responses. As opposed to Figure 5, members of the foreign language and social studies departments felt computers could contribute in the classroom. The writer concluded that these responses reflected differences between the classroom learning experience and gymnasium.

It was important that two additional departments (English and fine, practical and industrial arts), each with ten teachers, indicated overwhelming responses regarding the educational importance and contributions of computers. In fact, only the health and physical education department had less than 50% of the teachers indicate negative responses to either question. It was the feeling of the project manager, as a former member of the health and physical education department, that three members of the department were within four years of retirement and saw no need to change at this stage of their careers.

Overall, only teachers in the business and math departments indicated a knowledge of how to use a computer if one were available in the classroom. In seven of the nine department areas, less than 33% of the teachers indicated knowledge in the integration of computers into the classroom curriculum (See Figure 7).

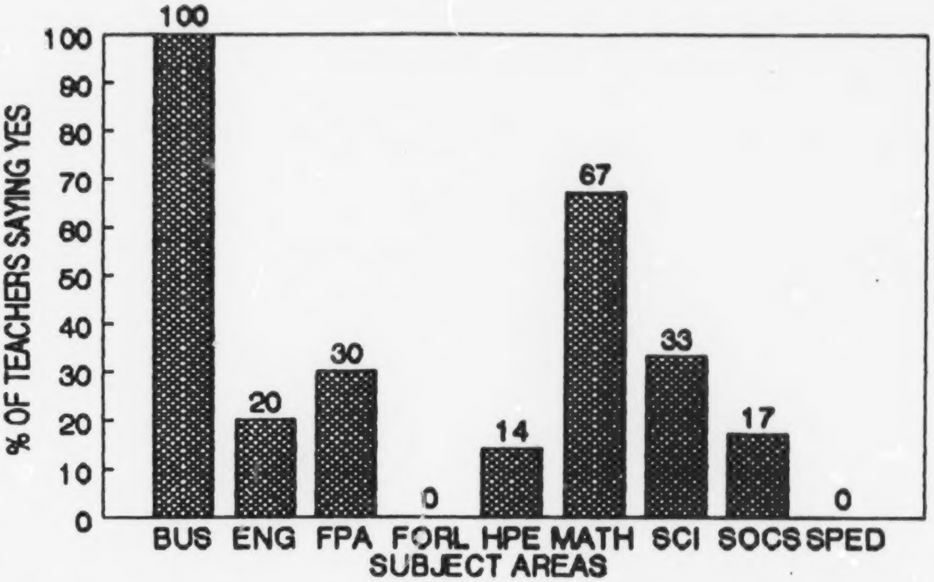

Figure 7. If available, would you know how to use a computer?

Figures 8 and 9 indicate the agreement and willingness of the faculty in acquiring the application (word processing, spreadsheet analysis, database management, presentation graphics and telecommunications) and domain (the specific importance of the computer to each curricular area) processes necessary for the use of computers in the classroom.

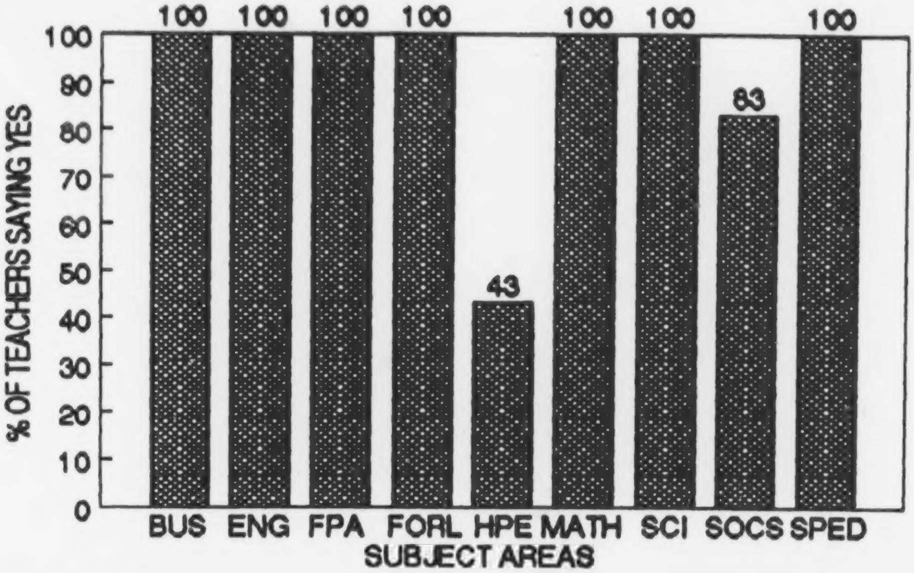

Figure 8. Would you like to know more about computers?

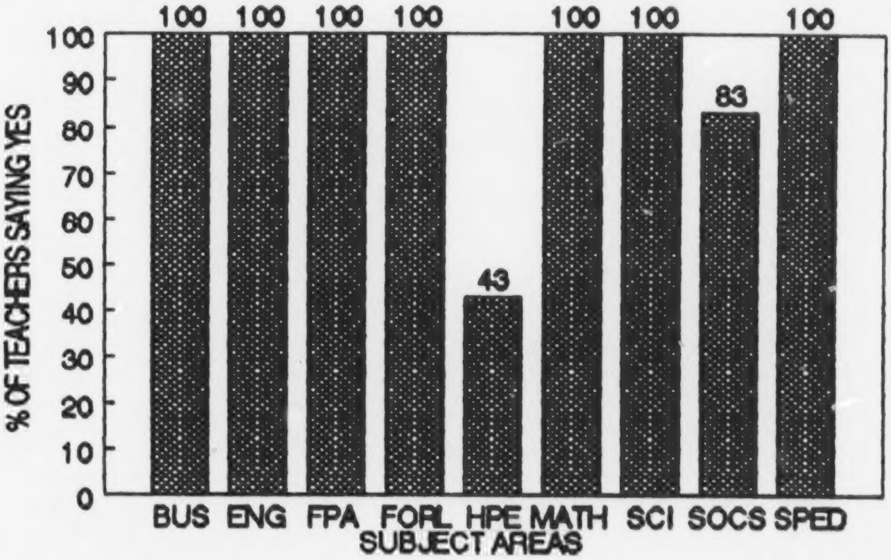

Figure 9. Would you like inservice time for computers?

In seven of nine department areas (business, English, fine, practical, and industrial arts, foreign language, math, science, and special education), 100% of the teachers indicated that they would like to learn more about computer use and application for the classroom and that time should be delegated for staff development or inservice. This last point was important for the purpose of future staff development planning. While a few teachers had self-initiated computer skill development, many additional faculty members either didn't have the knowledge of where to start, didn't have access to a computer, or didn't have the self-initiative to begin individually.

In order to assess the computer knowledge of the high school faculty and form guidelines for future staff development initiatives, a questionnaire was prepared and administered. The questionnaire reflected the vision of the future for computer technology at Hammonton High School. Results of the questionnaire can be seen in Table 2.

Table 2

Teacher Responses Regarding Knowledge in Computer Applications, Integration and Technology, June, 1990

Questions		Teachers (N=58)		
		Yes	No	Not Sure
1.	Can you use computers to support the instructional process in your subject area?	31%	60%	9%
2.	Can you apply computer application software in your subject area?	31%	52%	17%
3.	Are you familiar with electronic textbooks and learning materials in your subject area?	7%	93%	0%
4.	Could you integrate computers and develop educational strategies for problem solving, data collection, information management and decision making in your subject area?	17%	69%	14%
5.	Could you evaluate the effectiveness of computer software for educational purposes in your subject area?	17%	66%	17%
6.	Could you develop student learning activities designed around computer technology in your subject area?	17%	67%	16%
7.	Could you integrate computer instruction from your subject area with other subject areas across the total school curriculum?	14%	72%	14%
8.	Are you familiar with multimedia activities that support classroom instruction including video and laser technologies?	9%	91%	0%
9.	Are you skilled in using productivity tools for your professional and personal use?	38%	62%	0%
10.	Do you have a knowledge of the ethical and human issues related to computers?	10%	83%	7%

As Mecklenburger (1990, p.105) pointed out: "It's time to stop thinking about technology in education and to start thinking about education within the context of new technologies." The selection of questions represented the skills required to implement the vision for the integration of computers into the teaching-learning process across the total school curriculum at Hammonton High School. Before implementation of the questionnaire, it was realized that very few teachers would have a knowledge of most of the skills required for total computer integration. As evidenced by the questionnaire, most teachers either didn't possess this knowledge or were uncertain as to whether the skills were attainable. The uncertain response was important and meant one of two things. Either the teacher did not understand the question, or the teacher felt a partial understanding of the skill.

The computer skills reflected by the questionnaire identified a problem discrepancy in preparation that should be a part of each teacher's repertoire of skills and strategies by the end of a five-year period of time. The results of the questionnaire confirmed that staff development was the most essential aspect of the computer integration plan to be addressed. The results of the questionnaire also gave direction and provided focus for the staff development program at Hammonton High School over two years. Teacher buy-in was critical to the success of the integration plan. Once the district invested into the plan and purchased new computers for the purpose of curriculum integration, it was important that they not sit idle.

Another examination of data presented a clear picture of the problem discrepancy with regard to staff development. For three years, not one staff development program had addressed the educational utilization of computers for the entire faculty. The after-school and volunteer introduction to computers program registered only 11 teachers and consisted of 10 hours of instruction. Of the 14 staff development programs conducted by the central administrative office between 1987 and 1990, not one focused upon computer technology or application processes for teachers. Despite the enormous financial commitment to hardware and software in student administration and in curriculum and instruction, the teachers had been left largely to their own initiative to learn about computers. Staff development programs for the three-year period can be seen in Table 3.

Table 3

Staff Development Programs at Hammonton High School During the 1987-1988, 1988-1989 and 1989-1990 School Years

Topic	Length Hours	Day Type	Faculty Group
1987-1988			
Effective Teaching	25	Released Time	33% of Faculty
AIDS Instruction	12	Released Time	Health Teachers - Nurses
"Here's Looking at You 2000"	12	Released Time	Health & Phys Ed Teachers - Child Study Team - Nurses - Spec Ed Teachers
Student Achievement	2	District Inservice	H.S. Faculty
Student Self-Concept	2	District Inservice	H.S. Faculty
Student Motivation	2	District Inservice	H.S. Faculty
Basic Skills Improvement	30	Released Time	BSI Teachers
1988-1989			
Effective Teaching	25	Released Time	33% of Faculty
Stress Management	2	District Inservice	H.S. Faculty
Time Management	2	District Inservice	H.S. Faculty
Substance Abuse	2	District Inservice	H.S. Faculty
Basic Skills Improvement	30	Released Time	BSI Teachers
CPR Training	6	Released Time	Athletic Coaches - Health & Phys Ed Teachers
1989-1990			
Effective Teaching	25	Released Time	33% of Faculty
Crisis Intervention	10	After School	20 H.S. Faculty
Child Abuse	2	District Inservice	H.S. Faculty
Introduction to Computers	10	After School	11 H.S. Faculty
Basic Skills Improvement	30	Released Time	BSI Teachers

One final examination of data presented a clear picture of the problem discrepancy with regard to parental attitudes toward computer integration at Hammonton High School. It appeared to the project manager that, if the majority of teachers possessed little knowledge about the integration of computers into the curriculum, and many teachers were residents of Hammonton, then many parents and residents of the community would likewise have little knowledge.

The writer also recognized that little had been done historically to keep parents informed about the benefits of specific movements in the district. A questionnaire was developed and sent to 80 parents of students at Hammonton High School to assess their attitudes with regard to computer integration. The parents were randomly selected; 20 parents were chosen from each grade level. Over 75% of the parents had older children who graduated from Hammonton High School. Sixty-three parents, or 79%, returned the questionnaire (see Appendix A: 261-263).

Several items on the survey provided interesting results. Forty-eight percent, or 30, of the respondents agreed that computers in the high school curriculum should emphasize the programming area, while 44%, or 28, of the respondents disagreed. The nature of agreement was difficult to determine. Parental attitudes with regard to computers may have been developed while an older child attended high school. Since a number of parents had other children experience the high school's educational program, some of these students may have previously enrolled in the BASIC programming course. The design of the survey made it difficult to ascertain the nature of disagreement. However, because an uncertain response was permitted for each question in the survey, the project manager felt that parents were somewhat aware that the focus of computers in the school curriculum should be different.

Twenty percent, or 13, of the respondents agreed that computers could play a role in helping address discipline and attendance problems at the high school, while 40%, or 25, of the respondents disagreed or were uncertain about the connection. Disagreement and uncertainty were not surprising. The connection between computers and improvements in student discipline and attendance were consequent affects of integration. Many teachers were also unsure of the relationship.

Seventy-three percent, or 46, of the respondents were uncertain if students should be exposed to multimedia applications, telecommunications and graphics. The project manager concluded that most of the parents possessed limited knowledge or understanding of these areas.

Eighty-three percent, or 52, of the respondents were also uncertain if students could work better alone with a computer, as opposed to being part of a cooperative group. When this question was included in the survey, the project manager felt strongly that most parents would respond with uncertainty. In 1990, cooperative learning was a new educational initiative of the district, and few parents, if any, were aware of its significance to the teaching-learning process. However, incorporating cooperative learning with computers was innovative; teachers, for the most part, did not possess this type of visionary approach to computer integration.

Another question on the survey produced across-the-board results. Thirty-seven percent, or 23, of the respondents agreed that computers will more actively involve students in their own learning. However, 23%, or 15, of the respondents disagreed with the question while 40%, or 25, of the respondents were uncertain. The project manager presumed that many of the parents did not understand the question. However, the integration of computers into the total school curriculum, the changing role of the teacher in a computer classroom and the responsibility of students for learning were initiatives that would be actively pursued by the high school.

Generally, results of the survey confirmed the initial feelings of the project manger. Responses indicated that parents believed that computers were an important part of the educational process in the high school. However, it was apparent that parents, for the most part, were confused about the role, or function of, computers in the high school curriculum. Finally, parental responses indicated that strategies needed to address the dissemination of information regarding computer technology to parents and other community members.

Justification of Problem Situation as Problematic

Prior to the implementation of the Hammonton School District five-year computer plan for student administration and management, data accumulation and dissemination were completed in one of three ways: manually; with low capacity computer functions; or with off-site computer contracts. The three schools in the district also handled much of the same information autonomously, often proceeding in different directions with computer automation. The computer plan brought a common direction of growth for the district. It provided modern technical hardware with compatibility for future expansion and decreased data entry, turn-around and dissemination time by as much as 50% in some instances. In short, the computer plan improved district accountability internally and externally.

The curricular utilization of computers in the high school curriculum had not kept pace with the automation in student administration. Following implementation of the administrative computer plan, a computer applications curriculum was developed and a three-year project, consisting of two computer labs and a network arrangement, were designed to change the direction of the computer studies area in the high school. However, the initiative was delimited to the business and mathematics departments. In short, the integration of computers into the curriculum and the gains in productivity that it created were significantly behind the automation that had increased productivity and accountability in the student administrative services.

Probable Causes of the Problem

The obsolescence of the former TRS-80 computers and the lack of available software contributed to a deficiency in computer staff development and the integration of computers throughout the total school curriculum. Before the restructure of the computer lab, all of the networked computers were between 5 and 10 years of age; 12 of the 18 were purchased in 1980. Over a three-year period, the system failed 15 times at an average interruption of 3 days. However, the largest interruptions had a direct correlation with the age of the computers. As the computers aged, the system had more frequent and longer periods of down time. During the 1988-1989 school year, 20% of the total amount of instructional time was lost due to computer network breakdowns. The end result was a poor image for the computer studies area.

With the redesign of the computer lab and the purchase of the I.B.M. computers and network system (1989-1990), the amount of instructional time lost due to technical breakdowns was greatly reduced. However, the computer curriculum still reflected the original design and emphasis for the computer, to teach the BASIC language. During the 1989-1990 school year, significant literature reviews and planning resulted in major gains in the computer studies. Most rode on the coattails of the introductory practicum project. A computer applications curriculum was developed, a word processing curriculum was developed, and a PASCAL programming curriculum was developed. In addition, computer software was applied to the accounting curriculum, and the basic architectural drafting curriculums were redesigned around the computer. With regard to time, the computer lab reached full utilization during the 1990-1991 school year. One hundred percent of all available time during each school day was devoted to classroom instruction.

Despite the positive changes in hardware and software and despite the apparent eagerness of additional departmental areas to jump on the computer bandwagon, enough equipment still was not available to completely integrate computers throughout the total school curriculum. Utilization of the computer lab was a concern during the school day outside of assigned classes. Additional time for students and teachers to get substantial computer exposure to refine skills and perform tasks occurred either in classes below maximum capacity or before or after normal school hours. The media center was also available, with ten computers networked into the system. With approximately 144 students (or 22% of the total school enrollment) involved in curricula utilizing computer technology and an increasing number of teachers interested in learning more about application and integration, time-on-task was important. The inevitable goal was to ensure that students and teachers got the necessary exposure to provide technological benefit and to ensure that most received more than a cursory exposure outside the immediate classroom.

Prior to the 1990-1991 school year, the Hammonton Middle School utilized computers without systematic regard for the literature or practice. The computer lab at the middle school comprised 16 networked TRS-80 computers. All were between five and seven years of age. Although the middle school lab did not experience the same amount of failure as the high school, the system was not without interruption. The purpose of the lab was to provide a basis for teaching BASIC programming. Students in sixth, seventh and eighth grades were cycled into the lab for approximately ten weeks of time in order to receive exposure to, and learn programming with, BASIC. In addition to the TRS network, ten Apple IIe computers were utilized for computer-assisted instruction in the basic skills program. These were purchased with Chapter I Compensatory Education resources during the 1986-1987 school year and were only used by students in the basic skills program.

Riding on the coattails of the high school, the middle school computer lab was redesigned, and 16 I.B.M. Model 30 computers were purchased and networked with an I.B.M. Model 80 file server in July 1990. Programming with BASIC was eliminated from the curriculum and replaced with keyboarding and computer application cycles utilizing the Microsoft Works word processing, spreadsheet analysis and database management programs. The staff development program under consideration at the middle school was identical to that of the high school proposal.

Prior to the 1990-1991 school year, the Hammonton Elementary School computer lab consisted of 25 Apple IIe computers purchased during the 1986-1987 school year. The computers, serving as stand-alones, were utilized for computer-assisted instruction in the basic skills program. In addition, all second through fifth grade classrooms were cycled into the lab one day each week for keyboarding, introductory computer skills and computer-assisted instruction in reading or mathematics. No systematic curriculum process was followed, nor did teachers receive more than cursory inservice in the use of computers.

Also riding on the coattails of the high school, the elementary school computer lab was redesigned and 40 Tandy 1000 computers were purchased and networked in August 1990. A Josten's integrated instructional system for reading, language arts and mathematics skills was purchased, and the staff received several hours of inservice training in computer-assisted instruction. All kindergarten through fifth grade classrooms were scheduled to cycle through the learning lab one or two days each week for approximately 25 minutes. Students enrolled in the basic skills program or English as a Second Language received additional computer time.

Chapter 3

Problem Situation and Context

Written Policies, Procedures, and Commentaries

The Hammonton Public Schools had recognized computer education as an objective for the development of basic academic skills. The Hammonton Public Schools' Five Year Goals and Objectives clearly stated that students would develop fundamental skills in computers. The questions became, "What were the fundamental skills computers should develop?", and, "If students were to acquire these fundamental skills, what provisions would be made to enable the staff to acquire the skills and knowledge necessary for the development of the learning program?" District reflection indicated that these skills would differ from school to school within the district; however, all would respond to the changing technology.

Indirectly, the Hammonton Public Schools' Five Year Goals and Objectives recognized computer education, and in particular, application skills, as a contributor to the development of critical thinking, problem solving and marketable skills. Although these developments were always considered essential school district goals, their attainment through the use of computers was left to chance, and thus, became a direction for the future.

On January 12, 1989, the Hammonton Board of Education adopted the recommendations of a committee to revise the broadly stated goals and objectives for the school district. The project manager served as the district school administrator on the committee. The revisions were put into practice in February 1989. The following objectives encompassed a computer applications and integration methodology for goal attainment in the development of critical thinking, problem solving and marketable skills.

1) Students will be able to utilize problem solving techniques.
2) Students will learn to enjoy the process of learning and to acquire the skills necessary for a lifetime of continuous learning and adaptation to change.
3) Students will develop a marketable skill in at least one curricular area.
4) Students will develop skills in making career and educational decisions.

The initiation of these district objectives through computer applications and integration was a facilitating factor to the proposed research project. Through the district objectives, both direction and process were provided that allowed for systematic planning and evaluation in computer applications and integration.

The second example of written policies, procedures and commentaries involved the recommendations of the 1986 Middle States Association of Colleges and Schools evaluation. The visiting committee report recommended that Hammonton High

School develop long range plans that provide for the curricular and budgetary acquisition and use of computers. It also recommended that the school provide staff development in the instructional use of computers for integration across the curriculum. In no less than seven educational areas (art, industrial arts, mathematics, science, business, English and social studies), and on 13 occasions, recommendations reflected Hammonton High School's limitations in the computer studies area. Emphasis on the instructional use of computers, especially in applications and integration, was addressed primarily. Curricular and budgetary consideration, according to the report, should be given to the development of a long range plan of three to five years that allowed for staff development and utilized computers in these educational areas.

Perhaps it was this recommendation more than any other situation that provided impetus to the computer movement at Hammonton High School and proved to be the greatest facilitating factor. The response of the high school to each of the recommendations indicated long term planning and implementation. With a new Superintendent of Schools in 1987, many of the long term recommendations were placed into motion. The high school computer discrepancy was scrutinized closely.

Two final examples of written policies, procedures and commentaries involved the Hammonton Board of Education Policies on Instructional Services and Resources and Subject Fields. Both policies provided support for the computer studies area and proved to be facilitating factors for staff development and integration. Together, they provided the local justification for the acquisition of curriculum software and hardware, the initiation and continuity of staff development and the integration of computers throughout the total school curriculum.

The Hammonton Board of Education Policy on Instructional Services and Resources directed the Superintendent of Schools to provide the supportive resources necessary for teachers to implement the approved curriculum in their classrooms and to work effectively with the students. Through this policy, the Superintendent of Schools committed to the staff development program in order to improve the computer studies area and to integrate the use of computers throughout the total school curriculum.

The Hammonton Board of Education Policy on Instructional Services and Resources also stated that it was the school administrator's responsibility to establish and maintain services for curriculum, including technological materials, and to take appropriate channels through which teachers were supplied with the skills and resources. In accordance with this policy, an article in the NASSP School Tech News, "Study Identifies 10 Critical Success Factors" (1987), indicated that support from the principal was essential to the success of the computer studies area, with regard to staff development and integration. When involved in the process, principals generated a positive attitude for the staff and reflected commitment and continuity. Through delegation, the building principal provided the project manager the budgetary and curricular authority to establish curriculum services and staff development resources.

The Hammonton Board of Education Policy on Subject Areas also provided facilitating support for the staff development and computer integration plan. According to the policy, the board directed the district schools to offer a comprehensive curriculum that provides for the intellectual, social, and emotional growth of all students. While Board of Education emphasis focused on reading, mathematics and writing, it also recognized those subject areas, such as social studies, science, foreign language, business, fine, practical, and industrial arts and health and physical education, which serve as a foundation for educational development. The policy also mandated a written curriculum and instructional plan for each course or area designed to implement the intentions of the Board of Education. It was under this policy that the superintendent of schools and high school principal promoted the plan to integrate computers throughout the total school curriculum.

Norms for Behavior, Values, and Traditions

Teachers at Hammonton High School traditionally relied upon the lecture method of instructional delivery to the students. To some extent, this commitment inhibited the direction of the computer studies area and the integration of computers throughout the curriculum as teachers were complacent and content without reason to change. Although the "Effective Teaching" staff development programs were designed to address this issue, formal and informal observation and discussion between teachers and the project manager revealed continued emphasis upon the traditional lecture method of delivery. In reality, the teacher was still the "gatekeeper" to the curriculum and the classroom. Teacher reliance upon the traditional lecture method was considered a temporary constraining factor for the research project. The district had planned and committed to follow-up "Effective Teaching" staff development in order to address the horizonal articulation of critical thinking and problem solving skills.

Additionally, the traditional lecture delivery was inconsistent with the Hammonton Public Schools Five Year Goals and Objectives philosophy. The lecture method committed to teaching as talking and learning as listening and only realized the potential of students at the lowest levels of the cognitive realm. However, according to the district five year goals and objectives, the potentials of students at all levels of the cognitive realm through critical thinking and problem solving skills would be addressed. Due to the intent of the district to address and change delivery styles, the philosophy was considered a facilitating factor for the research project.

One final behavioral norm deserves mention. It was felt by the District Supervisor of Curriculum and Instruction that teachers would volunteer for staff development in computer applications and integrate one or more components into their course curriculum if one or two district credits of continuing education (for the salary scale) were awarded for completion. This statement was in agreement with two studies reported in NASSP School Tech News (April/May, 1987). Both studies reported extra pay or compensation or some form of traditional incentive as a significant factor in encouraging teachers to learn and use computers in the classroom. Hammonton High School teachers were no different from teachers in other districts. Although an overwhelming number of teachers indicated a desire for staff development, the number of volunteers would increase with a plan for salary credits for computer use and integration. The staff development incentive plan was considered a facilitating factor for the plan to integrate computers through the total school curriculum.

Formal and Informal Influences of Individuals and Groups

Within the framework of the research project, there were several individuals or groups which presented themselves as either formal or informal influences. The superintendent of schools and high school principal had, perhaps, the most formal influence upon the research project. The Superintendent of Schools for the Hammonton School District demonstrated himself to be a facilitative influence with encouragement and support for the restructure of the high school computer lab and curriculum. He also demonstrated his commitment and support for the staff development program by designation of two inservice days during the 1990-1991 school year. He was also committed to the integration of computers throughout the total school curriculum and was using the high school as a model for the middle school and elementary school in the district.

In cooperation with the project manager, the superintendent of schools generated a school district objective, one of three required yearly by the State of New Jersey for each school district, to review and revise the high school computer studies area. In addition, he committed and provided financial support for a three-year computer design project at the high school and for the five-year program that would result from the MARP experience.

The principal at Hammonton High School encouraged and supported the comprehensive curriculum offered to the students. In support, he stressed the importance of using the computer as an application tool for immediate and future curriculum integration. His support and interpretation of the district five-year goals and objectives to recognize computer studies as a contributor to critical thinking and problem solving skills greatly enhanced the focus of the redesign project and promoted the five-year plan developed as a result of the MARP experience. In addition, he facilitated the computer project through financial support and commitment.

The principal's support of technology through automation was also stressed in other areas. He infused television monitors, VCR's and a cable network into each learning station within the school. In addition, he had promoted entrance into the Satellite Education Resource Consortium (SERC) and designated the project manager as the site coordinator, allowing the high school the opportunity to utilize a satellite dish in a variety of educational initiatives. His long range plans included a video studio at the high school. Plans were also included in the five-year integration plan to coordinate the satellite technology into the computer network.

An enormous amount of technical support for all of the computer projects was provided by the Supervisor for Math and Science. Having an extensive technical knowledge and background in computer studies, he greatly impacted upon and facilitated the selection of hardware, the design of the labs and the quality of technical support. He had also indicated that he would teach the computer application components to volunteer teachers in the staff development program from November 1990, through February 1991, thus providing a trainer extremely knowledgeable about the subject. At the request and justification of the project manager, the superintendent of schools designated the supervisor for math and science as the I.B.M. liaison for technical support and services. The knowledge and support of the supervisor for math and science was a facilitating factor for the success of the research project.

The high school faculty had a positive attitude towards the topic of computer curriculum and integration revision. Several members of the faculty were asked, through informal discussion, to respond to questions related to computers applications and integration. All agreed with the practical learning experience created by computer applications and integration throughout the curriculum. For example, three English and two social studies teachers indicated they would like to require research papers and book reports to be completed through word processing. Writing assignments in these classes could routinely use such a computer tool through integration instruction. In addition, two science teachers indicated that they would like to be able to use computer applications in laboratory experiments to collect and analyze data and to write the reports. All of the teachers also indicated an interest in learning more about domain specific software. The attitudes of these members of the high school faculty were considered a facilitating factor for the success of the computer integration plan.

Two teachers in the mathematics department had extensive knowledge and preparation in computer programming and applications. In addition, two teachers in the business department also had extensive knowledge in word processing. All of the teachers in the business department had received staff development during the introductory practicum project in word processing, spreadsheet analysis and database management. These faculty members contributed greatly and facilitated the plan to integrate computers throughout the total school curriculum.

External Circumstances

Traditionally, the community had supported the public schools in Hammonton. Since the superintendent of schools assumed his position and responsibilities in July 1987, a considerable emphasis had been placed on public relations. The community's attitude and support toward the school district had increasingly changed from good to excellent. After failing to support several consecutive budgets, the community overwhelmingly approved three consecutive budgets, despite large increases in the budgets and decreases in state equalization aid. Although not everyone in the community was pleased with the direction of the school district, enough support had been generated to keep the budget from becoming a political football. The positive public relations approach of the superintendent of schools and the supportive community attitude toward the schools were considered facilitating factors for the research project.

In addition, the board of education had remained stable during that time. In three elections since the superintendent had assumed position, not one incumbent lost an election. The above factors indicated that the community had confidence in, and support for, the school district. These also contributed to the operation of project strategies.

The board of education had also supported the curricular and financial recommendations of the superintendent of schools. For five years, curricular and financial emphasis had been on improving student scores on the Minimal Basic Skills (to the 1985-1986 school year) and the High School Proficiency tests (since the 1985-1986 school year). With 96% of the ninth grade students passing all three sections of the test and achieving the testing criteria for a state endorsed diploma, board of education financial emphasis returned to a review, revision or augmentation of other areas of the curriculum.

The business community expressed concern that many Hammonton High School graduates did not possess basic entry level computer application skills for the job market. Although this concern was addressed during the introductory practicum experience, computer staff development and integration remained primary issues. Many students at Hammonton High School continued their education beyond high school; however, most did so locally (within 60 miles) and returned to the community for employment.

Of all the businesses informally questioned (representing a cross section of the town), all used computers. In addition, all were using I.B.M., an I.B.M. compatible or an I.B.M. clone. All indicated that students should be exposed to computer applications. In addition, several prominent members of the business community informally questioned by the project manager felt that the high school staff should receive instruction in computer integration. According to these members of the business community, computers should be infused into the school curriculum. But first, teachers should be trained in order for the students to receive the most benefit. This information provided a facilitating factor for the project strategies to integrate computers throughout the total school curriculum at Hammonton High School.

Chapter 4

Problem Conceptualization, Practicum Outcomes and the Solution Strategy

Bibliographic Research and Review of Literature

A review of the literature suggested four areas of concern to integrate computers throughout the total school curriculum. These included: utilizing current and appropriate hardware and software; providing staff development and appropriate training; involving exposure to a wide range of application and domain specific programs integrated throughout the total school curriculum; and enhancing and developing community involvement.

Due to rapid advancements in technology, West (1989) suggested an allotment for capital expenditures in order to replace hardware when a school district's computers reach five years of age. Of the two dominant educational computer manufacturers, I.B.M. and Apple, West recommended the purchase of I.B.M. computers due to the advanced networking system. I.B.M. also used the business standard MS-DOS operating system, which was not used on Apple equipment. All of the computers utilized in the Hammonton High School computer lab during the 1989-1990 school year, and planned for classroom integration, were I.B.M. Model 30-286 machines integrated into a Local Area Network (LAN) system. Each computer also existed as a stand-alone.

Sybouts and Stevens (1986) suggested a model that provided safeguards and a means of avoiding pitfalls when selecting hardware and software for new or replacement acquisition. The model presented a sequence of systematic and judicious steps that provided guidance for introducing or replacing computers in schools. The steps included: establishing basic assumptions and involvement in the selection process; developing a mission or purpose for defining measurable outcomes for the curriculum; establishing evaluation criteria to determine effectiveness; training the appropriate staff; implementing a pilot program assessing the effectiveness of the outcomes; and refining the program, if necessary. The rapid pace with which changes in technology occur makes it difficult to keep abreast of current developments. The model was worth considering to help avoid inadequate equipment and obsolescence.

McManus (1985) also suggested planning for the software and design of the computer lab before acquiring the hardware. In addition, he recommended allowing ample delivery time, purchasing an ample supply of printers, providing adequate equipment and installing adequate security. These recommendations were considered to maintain the integrity of the change process in the redesign of the computer lab. They were also considered in the purchase of equipment for the five-year integration plan.

Tarwater (1990) stated that the task for computer integration was to provide teachers with tools and programs that motivate students and expand instructional pedagogy to creative limits, thereby allowing students to reach their fullest potential and better prepare them for life and work in the twenty-first century. To accomplish this, a technological diet offering more excitement and impact than normally found in conventional classrooms was necessary. For integration of computers throughout the total school curriculum, Tarwater recommended that each teacher in every classroom be provided with three networked computers with color monitors, one printer, and various peripheral hardware. In addition to normal network software for maintenance and communication, Tarwater also recommended an integrated instructional system and specific application software for word processing, spreadsheet analysis, database management and presentation graphics. All of the hardware described in Tarwater's report was manufactured by I.B.M.

Of all the available domain specific and simulation software available for computer curriculum integration, Arnett (1990) reported that multimedia is taking computers into a new era. According to Arnett, the computer would be just as important in the next five years for communications and audio-visual presentations as it is now for information processing.

According to Steinberg (1990), multimedia was the technology of bringing photographs, animation, recorded voice and music and video under the control of a computer. In education, simulation presentations could be created by the teacher, thus ensuring curriculum alignment. Multimedia software had the capability to show students how to perform a skill or task, rather than just describe it. It also had the promise and potential to create educational simulations in the biological and physical science labs and industrial arts, music, art, health and physical education, and home economics areas of the curriculum.

Beyond the number of computers in schools and the cost of hardware and software, existed the scope of teacher preparation in computer applications and the direction of the curriculum. This became a two-step problem. The first centered upon the training of currently employed teachers, while the second revolved around the long term implications that the effective use of technology in school settings implied. Since most high schools had a workable number of computers and many had networked labs, how did schools get and keep teachers enthusiastic about the computer as a tool and ensure a "technologically literate" teaching group (Diem, 1984)? Staff development, then, became the real key and was concurrent with any planning for computer integration.

The introduction of computers into the educational system without planning for teacher preparation would, in the long term, disappoint teachers and cause them to reject the technology. According to a survey conducted by the National Center for Technology in Education at the Bank Street College, New York, New York, and cited in Education Week (May 9, 1990), staff development programs in computer technology were not keeping pace with teachers' growing desires to more fully incorporate computers into the curriculum. Teachers skilled in the use of computers indicated that they learned their knowledge and application skills not from teacher inservice training, but from their own investment of time and energy. Weak, short term training for staff development in technology and applications ignored the tremendous potential computers hold for transforming schools and were ineffective in changing the attitudes of teachers toward computer technology. The findings of the survey also indicated that staff development should be designed to show teachers that computers can integrate across the curriculum and were suitable for all subject areas in a variety of ways.

Staff development and training involved not only how to use software and hardware, but also the basic application skills and domain specific skills necessary for curriculum integration. Utecht (1983) reported the need for teacher staff development in the computer studies area. Based upon faculty priority rankings from a questionnaire, four objectives were developed for the workshop sessions:

1) All staff members should know how to operate a computer through hands-on use.
2) Staff members should be familiar with classroom uses of the computer.
3) Staff members should be familiar with teacher utility software for the computer programs that help teachers

manage their work and students' work more easily.

4) Staff members should have maximum opportunity for continued learning.

According to Bowman (1983), faculty development must focus upon matching instructional needs to hardware and software capabilities if schools are to effectively utilize computers to deliver the curriculum. Across a three-to-five year masterplan, expenditures must evenly be divided for hardware, courseware and staff development in order to reflect the dynamic nature of computer technology, the evolving sophistication of instructional software and the longitudinal realities of continuous professional development. Training sessions for teachers should provide opportunities for professional staff to cluster by subject area to identify curricular needs across grade levels or academic programs.

According to Showers and Joyce (1987), teachers were much more likely to keep and use new strategies of instruction if they received coaching (either from an expert or a peer) while they were trying new strategies, if they received prompt feedback about their efforts, and if they received continued one-on-one support. Commitment, or buy-in, to a teaching strategy follows competence, rather that preceding it. Once teachers developed a skill and learned how to use it, they reached a position where they could make decisions about its use.

David and Rafi (1984) stated that, in most cases, teachers were not prepared for the computer age and its implementation in schools and that teacher training was one of the most important and essential aspects that had to be addressed. Rapid introduction of computers throughout the total school curriculum without any planning or preparation would, in the long run, disappoint teachers and cause them to reject completely the technology. David and Rafi suggested five guidelines for introductory staff development: (1), defining a realistic estimate of the capabilities and constraints of applying computers to education; (2), presenting the diversity of the use of computers in education; (3), acquiring basic concepts and skills concerning the use of computers in education; (4), creating positive attitudes towards computers by developing a sense of control over a computer and a demystification of the technology; and (5), developing judgement skills for decision-making concerning hardware and software utilization.

Beal and Cole (1983) stated that the key to a school or school system making the best use of computer technology involves modifying teacher behavior through inservice training. This helps to overcome any "cyberphobic" feelings and to fulfill the promise of computers as instructional tools.

Diem (1984) described the scope of teacher computer training as a two step process: The first dealt with the short term training and educational computer needs of currently employed teachers, while the second revolved around the long term implications that the effective use of computers in the school setting implies. Most employed K-12 teachers had not had even an introduction to current educational computer innovations. Until a new generation of teachers enters the educational market with computer studies and applications as part of the degree requirements, ongoing developmental inservice activities must be included to help those teachers already in the classrooms. Diem recommended a rational, effective staff development based upon four main ideas:

1) Technological training is non-course-specific.
2) Training emphasis must be on curriculum development rather than on programming development.
3) Criteria for evaluating software and hardware have to be ongoing as technology changes.
4) Constant application, by grade and/or subject level, must be infused into instructional objectives for particular disciplines.

If teachers were to effectively utilize computers to deliver the curriculum, Fary (1984) stated that teachers must, themselves, become competent in the use of computers. Teachers, as a result of staff development, should be aware of the capabilities and limitations of computers, be able to make informed judgments about the social and ethical issues involving computers, be familiar with the applications of computers to teaching in their subject area and be able to judge the value and make informed decisions for both software and hardware. According to Fary, skill in software selection was essential for intelligent use of computers in the classroom.

Staff development programs should be geared to the concerns and needs of the teachers. According to Mueller (1985), teacher expression into computer staff development was necessary in order to realize a commitment to make them an integral part of all courses. Volunteer teachers, with an intent on learning more about computer applications, provided input for the course, took the developmental course, and then worked with a fellow teacher to integrate the applications into a course curriculum. From these courses, more sophisticated training programs were developed. Mueller also explained two additional strategies that increased support and commitment to the use of computers. First, the faculty had to feel that the change to computer applications and integration was inevitable. And second, a person had to be designated who would outline the plan for integration, someone who worked well with people, an idea person who could follow through on the plan once it was formulated.

Pullman and Parsegian (1990) committed to an applications staff training program in order to familiarize teachers with the computer and to provide a basis for further development. Their approach focused on specific techniques for simplifying administrative and instructional responsibilities in word processing, spreadsheet analysis and database management. Basic instruction in the use of each tool was provided, and teachers completed a simple practical exercise that could be implemented administratively or instructionally. According to Pullman and Parsegian, when computer technology was properly integrated into the educational setting, teachers could see a rationale for its use and took to it with appreciation and enthusiasm.

Stecher (1987) reported two conclusions for the most effective staff development success factors. First, enough computers and materials had to be provided for all participants. This meant one computer per teacher during the training process. And, after training, teachers had to have access to a computer. Second, regular, one-on-one follow-up with a knowledgeable trainer had to be incorporated into the staff development program. Newly trained teachers in computers needed a knowledgeable person on-site to whom they could turn for individual help. According to Stecher, the likelihood that a teacher will seek out help was inversely proportional to the distance the teacher had to go for help.

The literature suggested a normal progression with regard to the educational development and implementation of computer technology. According to Moursund (1986), computer literacy in the early and mid 1970's constituted programming skills. Computers were represented as complex and difficult to learn, and concentration focused primarily upon BASIC programming. Gradually, additional programming languages changed the format of computer literacy. In addition, "Computer-Assisted Instruction" (CAI) evolved and provided a technological approach to drill and practice application.

According to Becker (1984), the traditional beliefs about the most effective ways of learning, especially in math, reading and writing, included the importance of repetitious practice of skills and the memorization of facts and relationships. These formed the basis of CAI. Becker also stated that the reason schools continue to use BASIC programming and drill and practice programs was that many schools had begun their involvement with computers without a systematic plan of how computers could improve the educational process.

Durbak and Sadnytzky (1984) reported that as much as 70% of all future job opportunities would be tied to computers and their use as essential employment elements. In order to prepare students who will either be employable or prepared for post secondary education, students needed to be able to use the computer as an integrated tool.

Each school district had to assume responsibility, because of the nature of the computer itself and its many projected uses in society, to educate as many students as possible in computer studies. In agreement, Guse (1986) stated that all high school students should be using a computer in some way integrated into some academic discipline. At least one computer lab in each secondary school should be designated and used for curriculum integration and applications.

According to Otto (1986), initial computer exposure should provide students with a set of generic skills that could be used in the decision making process. These skills included: word processing; database management; spreadsheet analysis; file management; graphing; and combinations of the above. These skills provided the foundation for all future curriculum integration.

Becker (1984) suggested five theoretical visions for computers that directly addressed educational outcomes. Under the term "medium of instruction," he subsumed a number of educational uses of computers that focused on curriculum integration. First, the computer had the ability to engage students in a highly motivating and stimulating active dialogue, to provide appropriate instructional stimuli on an individual basis and to provide diagnosis and feedback both to the student and to the teacher. Second, the computer had the ability to create intellectually stimulating environments for students to explore subject matter generally foreign to the current curriculum, perhaps beyond the competency of the teacher, but important and useful preparation for the student's future life. Third, the computer had the ability to provide students with the resources of a convenient, accessible and easily used library and teach skills necessary for subsequent adult responsibilities. Fourth, the computer had the ability to provide learning experiences and opportunities through simulations, experiences that would otherwise be too costly, too risky, too time consuming or not possible. And finally, the computer had the ability to foster the capacity to perform analytic tasks and solve problems involving information.

According to Neudecker (1989), educational emphasis dealt with thinking and understanding. From this, a new definition of literacy had evolved; the new definition was based upon a set of criteria prerequisite for individual success in the twenty-first century. Mastery of the basic computer tools was termed "applications literacy." It involved word processing, spreadsheet analysis, database management, presentation graphics and telecommunications. These integrated tools enabled each student to draft and edit written communications, illustrate ideas with charts and pictures, manipulate numbers and store, organize and retrieve information. With computers, these tools become the workstations for students in school. Neudecker termed the second level of literacy "domain literacy." Domain literacy involved the computer tools of specific importance to each individual curriculum within the total school experience. Examples of domain literacy included CAD/CAM programs in technology education and lab simulations in the biological and physical sciences. Each tool had specific importance in its domain and should be integrated into the curriculum. According to Neudecker, students exposed to computer-integrated instruction would analyze tasks in terms of the goal and the best software tool to utilize for achievement.

Vasilakis (1990) reported that different groups should be involved in planning any long range educational program. The more diverse the composition of the planning committee, the better the chance of overall acceptance. School personnel should welcome comments from community groups and place community members on the planning committee.

According to Utterback and Kalin (1989), inviting community members to participate on the planning committees of programs provided an avenue for constructive community input, improved the quality of programs, and strengthened school-community bonds. The benefits of the collaborative process also built community stakeholders in the program and created a positive future for the school.

Kudlacek (1989) suggested involving key special interest group leaders from the community in the planning stages of major new programs. People support what they help to create and according to Kudlacek, once asked to be a part of a solution, many vocal opponents would become some of the most vocal supporters. Kudlacek also suggested the following process for community member selection. Once school personnel have been selected for the planning committee, have each make a list of ten community members to whom others go for information about the school system. Parents, nonparents, vocal and nonvocal critics and vocal and nonvocal supporters should be included. Common names should be contacted to ask if they would be willing to invest time and energy into planning and creating a new or particular program for the school. Usually the names of 10-20 community members were included on the list. If the scope of the project did not require 10-20 community members, the school staff could determine an appropriate number. However, one from each of the groups should participate on the planning committee.

The references cited recommended a secondary computer curriculum focused upon an application and integration approach and the initial and continual preparation of the instructional staff for the delivery of the curriculum. The application and integration approaches, a planned staff development program and community involvement were lacking at Hammonton High School at the start of the MARP experience. When developed and implemented, they should provide a foundation for technology throughout the total school curriculum.

Data Gathered Through Consulting Others: Experts, Conferences, and Site Visits

In accord with the concept of interdisciplinary application processes and integration, Mecklenburger (personal communication, July 1989) described five major goals for the use of computer technology in our schools during the 1990's.

These included: improving the curriculum; improving administration; improving the teaching-learning process; expanding services; and providing portable learning. Of the five goals, four had the potential to be addressed through an integration approach to computer instruction.

Mr. Jack Jennings, Director of the Educational Technology Training Center of the Regional Curriculum Services Unit, Sewell, New Jersey, (personal communication, June 4, 1990), agreed that staff development provided the single most important contribution to the success of computer integration in an educational setting. Staff development was one of the most important and essential aspects of the computer plan that should be addressed. It was also the most overlooked. According to Jennings, it was best to induce teachers into computers by showing them how they could better help themselves or their students. Schools in New Jersey that, in his opinion, met the following criteria experienced the most success in the computer plan and program:

1) Teachers were made to feel comfortable and received individual attention during training sessions.
2) Teachers received adequate hands on time with one computer per teacher during training.
3) After training, teachers had access to a computer.
4) Opportunities were provided for teachers to interact among themselves.
5) With regard to curriculum integration, a computer lab was

available that allowed for flexible, accessible scheduling.

Jennings also felt that the Microsoft Works integrated word processing, spreadsheet analysis and database management software package was an ideal staff development application that enhanced staff productivity and creativity and allowed integration.

According to Dr. Carol Scelza, Technology and Computer Center, State Department of Education, Trenton, New Jersey, (personal communication, June 5, 1990), the integration of computers throughout the school curriculum was gaining impetus throughout the state. Complete integration implied two process goals: that teachers use the computer as a tool transparently or without thinking, just as they would use chalk and a chalkboard; and that the specific computer curriculum disappears. This last point the project manager found interesting. According to Scelza, the disappearance of the computer course of study in a school implied complete integration throughout the curriculum and ensured compliance with the first process goal.

Several "specimen" schools existed in the State of New Jersey, although only one existed south of Trenton. According to Scelza, these schools and school districts had achieved complete integration of computers throughout the curriculum.

Dr. John Tenbrook, Dean of Business and High Technology at Camden County College, Blackwood, New Jersey, (personal communication, November 27, 1990) emphasized the integration of computer application skills into the total school curriculum. Areas of concentration included: word processing; spreadsheet analysis; database management; presentation graphics; telecommunications; and multimedia applications.

Each application program had the potential to serve as a tool for integration. For example, some subject areas of the school curriculum might require word processing applications for book reports, lab reports and special projects. These same subject areas might upload the projects through telecommunication applications to an electronic bulletin board at some centralized terminal for students in another part of the state or country or download a similar type of project from the same students. The business, mathematics and science departments might integrate spreadsheet analysis applications with word processing. The fine, practical and industrial arts areas could utilize graphics capabilities, in combination with other applications, for the creation and presentation of visual projects. According to Tenbrook, multimedia had the potential to serve as the link that integrated all application processes into the total school curriculum. It was this application the promised the most interesting possibilities for the teaching-learning process in the future.

Project Outcomes

It was anticipated that with the implementation of the manager's research project, the following terminal objectives would be achieved:

1) As a result of a six-month developmental process extending from November 1990, through April 1991, including high school teachers, supervisors, administrators and students and members of the community, a five-year plan for staff development and the integration of computers throughout the total school curriculum will be adopted by the Hammonton, New Jersey, Board of Education as measured by a vote of the members at a regularly scheduled public meeting in May 1991.
2) As a result of a volunteer staff development program emphasizing computer application skills in word processing, spreadsheet analysis and database management, including pilot teachers in all curriculum areas at Hammonton High School, and extending from November 1990, through February 1991, 100% of the teachers enrolled in the program will successfully implement one application in at least one class, as measured by formal classroom observations.

In order to achieve the terminal objectives of the research project, it was considered necessary to obtain the following intermediate objectives:

1) As a result of a staff development program emphasizing computer application skills and specific domain processes for each curriculum area, including all teachers at Hammonton High School, and comprising six

hours of inservice training during the months of April 1991, and May 1991, all responses in Table 1 (p. 20) will be positive for the majority of teachers, as measured by a questionnaire.

2) As a result of four staff development programs during the 1991-1992 school year emphasizing training in computer integration, multimedia applications and software evaluation, and including initial exposure, follow-up training and one-on-one support for implementation into the curriculum, all responses in Table 2 (p. 32) will be positive for the majority of teachers, as measured by a questionnaire.

3) As a result of a parent's newsletter developed around the theme of computer-integrated instruction and disseminated in the Fall of 1991, and a parent's night program designed to introduce parents and community members to the plan to integrate computers throughout the total school curriculum and implemented in January 1992, all responses will be positive for the majority of parents and community members in attendance as measured by a questionnaire (see Appendix A: 262-264).

During the implementation of the research project, the project manager was alert to possible side effects which could develop. Three were anticipated. First, when the superintendent of schools gave formal permission for the staff development proposals for all high school faculty in April

1991, and May 1991, he did so with a condition. Although beyond the scope of the MARP, the project manager had to develop an on-site inservice plan for the elementary and middle schools, coordinate the activities in order to promote curriculum integration, and designate and train site coordinators. For a two-year period, the elementary and middle schools had jumped on the computer bandwagon and closely followed the high school plans and proposals. For the 1990-1991 school year, all three schools had networked computer labs.

The second side effect, in the long term, was considered the most important with regard to the future direction of computers in the district. After an informal conversation with the superintendent of schools about the staff development and computer integration five-year plan, the project manager was delegated the task of a written justification for the creation of a new district position, Supervisor for Educational Technology. This position, if it came to fruition, would provide the necessary direction to the computer studies area as the Hammonton Public Schools approached the twenty-first century.

As the five-year plan for the integration of computers throughout the total school curriculum developed, financial resources became essential. To remain on schedule, especially if the elementary and middle schools continued pace, alternative funding sources, outside of the local budget, needed exploration. A U.S. Department of Education (Technology Education Program and Computer Based Instruction) grant application was a possibility and represented the third side effect of the project. It was speculated that grant writing might become an entirely new educational dimension for the project manager. And, grant approval could mean as much as $400,000.00 for the high school computer integration project.

It was the desire of the project manager to have the results of this project reflect positively upon the long range goals of the school district. The Hammonton School District was committed to providing current automation and technological orientation. Formally, it was expected that this development would result in a systematic process for the review and augmentation of the high school computer studies curriculum with reflections for all curriculum areas.

Proposal Solution Components

The proposed research project contained two major elements of action for problem resolution. First, impetus of the project concentrated on the development of a five-year plan for the integration of computers throughout the total school curriculum. Implementation of 18 months was included in the project design. Five members of the high school faculty, one supervisor, and one board of education member, as well as two students and two members of the business community, were to serve with the project manager on the development committee. Following the indications of the literature, an integration plan was to be developed that emphasized the application skills of word processing, spreadsheet analysis, database management, presentation graphics, telecommunications and domain specific software that met the dynamic needs of each curriculum and challenged higher level cognitive skills. It was to be developed from November 1990, through April 1991.

The design of the integration plan required substantial hardware and software acquisition. Based upon communications with I.B.M. technicians, several innovations were possible. Every learning station within the high school facility was designed to have a computer with the capacity to serve as a stand-alone or as a terminal on a larger network system. Each learning station computer would also network into a television monitor, thus providing a larger viewing screen in each classroom. This last innovation would allow access into the school's television cable and, in turn, provide access to upload and download the computer potentials of the satellite dish. A minimum of one classroom for each subject area was also designed to have five or six computers, thus integrating cooperative learning experiences and computer simulations for the students.

It was estimated that Hammonton High School would eventually support four or five technical network systems arranged to house specific domain software applicable to several departmental areas. According to I.B.M. technicians, the file servers could also be networked in order to maximize software utilization.

The second major element of action for problem resolution involved staff development. As previously stated, little continuity and direction existed for the implementation of computers at Hammonton High School. Despite a lack of technological or even applications knowledge, many staff realized the value of computers and were interested in learning more about their integration into the curriculum. Common direction was necessary; a systematic plan needed to address how computers would improve the educational program. Teachers neither had the knowledge nor the skill to realize the full potential and benefits of computer integration. The gains in productivity (student achievement and educational values) created by the integration of computers throughout the curriculum had to demonstrate a magnitude in improved learning, and prove cost effective, or any additional investment of financial resources and time and energy would not be justifiable.

The strategies for effective staff training included a volunteer computer applications course for high school faculty offering 18 hours of instruction in word processing, spreadsheet analysis and database management. The program was designed to provide practical projects that could be integrated into the classroom and would include, but not be limited to, term paper and book report development, spreadsheet problem analysis and personal database use. The program was designed to start in November 1990, and continue through February 1991; one district credit of continuing education would be awarded for successful completion. One additional district credit of continuing education would also be awarded to each volunteer teacher who integrated one or more components of the computer application inservice into the specific curriculum. Integration applied to student instructional activities. Both staff development proposals had been approved by the Board of Education.

Additional staff development was designed to occur for all high school teachers at inservice workshops in April 1991, and May 1991. The attempt was to provide hands-on experience in application and domain specific software for each departmental area by utilizing the existing computer lab and media center. Historical and geographical simulations would be available for teachers in the social studies department, as well as lab simulations in the biological and physical sciences, and health simulations in the health and physical education departments. In addition, all teachers would receive hands-on simulation training in multimedia and interactive videodiscs and attend a software fair. It was thought that the software fair would present both domain specific and interdisciplinary software. Four additional program presentations during the 1991-1992 school year (and, although beyond the scope of the present project, an additional four inservice programs for the 1992-1993 school year) were planned to focus upon domain literacy, multimedia applications, computer ethics and software evaluation and selection.

One intended outcome of this project was the development of a comprehensive staff development program that provided teachers with a primary set of computer skills, application knowledge in word processing, spreadsheet analysis and database management, and eventually, in presentation graphics and telecommunications. Staff development would also provide teachers with specific domain knowledge and skills. The process should be continuous.

The staff development plan was designed to produce two notable changes at Hammonton High School. First, computers would be integrated into the total school curriculum as a student tool for learning. Second, teachers would use the computer to automate their administrative tasks and augment instructional delivery.

Teachers also had to be presented with a set of evaluation skills in order to make judgmental decisions with regard to the worth of specific software programs. According to Doyle (Education Week, June 20, 1990, p. 36), "Technology is designed to increase output, regardless of the field or service. Educators, however, seem not to have grasped a fundamental truth. Technology is supposed to more than pay for itself by the gains in productivity it creates." At Hammonton High School, gains would be measured by, but not limited to, student achievement.

During implementation of the integration plan, additional staff development would be provided. As specific departmental areas infused computers into the curriculum, either on-site inservice in the high school computer lab, or off-site inservice at the I.B.M. training center in Mt. Laurel, New Jersey, was be provided for each teacher. If necessary, additional on-site and off-site staff development programs would be initiated with one of the several software companies located in the Philadelphia, Pennsylvania, metropolitan area. Consideration was also given to ensure that financial support for staff development was adequately represented in the implementation plan. This process would allow time for teachers to develop and incorporate various teaching and learning strategies into the computer integrated curriculum.

To create conditions that maximized the development of computer application and integration skills for teachers, a center for teachers would be created to sustain practice and to provide conditions for expert and peer support. It was planned that four computers would be set up and maintained in a small air-conditioned office located adjacent to the networked computer labs. These computers would also be networked into the file server, providing access to most software. Specific software programs for review, initial learning or follow-up learning would also be secured and placed onto the hard disc drive of several computers.

The teacher computer center would be open each day that school was in session from 7:30 a.m. until 4:00 p.m. The teacher workday was from 7:45 a.m. until 2:30 p.m. Teachers would have access to the center at any time during the hours as it fit into their individual schedules. On three days each week, from February 1991, through June 1991, and during the entire 1991-1992 school year, the supervisor for Math and Science would provide small group training and one-on-one support in the center from 2:30 p.m. until closing. It was planned that the project manager would also provide one-on-one support, although at more infrequent intervals. Teachers would also be encouraged to work cooperatively with a peer in the center to receive feedback and continued one-on-one support.

Community involvement in the plan to integrate computers throughout the total school curriculum involved four themes. First, two community members would be invited to serve as representatives on the planning committee. Second, based upon the results of the survey, a newsletter developed around the theme of computer integration would be disseminated throughout the community during the Fall of 1991. The purpose was to provide the community with an initial knowledge base in computer integration, create an awareness of the current state of the high school with regard to computer technology and to disseminate the district vision and high school plan for computer technology and integration in the future. Third, the project writer would develop several newspaper articles for the Hammonton News, the local weekly newspaper, based upon computer integration. During the Spring of 1990, the project writer prepared a biweekly article for the newspaper as a local "expert" on current educational trends. And fourth, a parent's and community member's night program would be designed and held in February 1992, to introduce the public to the high school program and provide hands-on opportunity and experience in the labs.

Chapter 5

Historical Account

Original Action Plan

The original action plan contained five major elements for problem resolution. These included development of a five-year computer integration plan, acquisition of hardware and software, staff development, creation of a teacher-training center, and dissemination of information to the community.

A computer integration committee was established to include five members of the high school faculty, one board of education member, two students, two members of the business community, the supervisor of math and science and the project manager. Early in the implementation period, the committee process was designed to foster trust, cooperation, and collegiality. After the initial process, the tasks of the committee were coordinated to provide opportunity for discussion of computer integration literature; develop rationale and goals for the computer integration plan; review, evaluate and select appropriate software; visit other school districts emphasizing computer integration; coordinate staff development activities; and disseminate the plan to the public. To facilitate the committee process, release time was planned for several meetings, staff development programs and the site visitations.

The major thrust of the MARP experience was designed to focus upon the development and initial implementation of a five-year plan for the integration of computers throughout the total high school curriculum. Primary focus of the plan was to improve the teaching-learning process through a maximization of computer technology. The original concept included placing computers into every classroom and learning center in the high school. The promotion of critical and creative thinking, problem solving and cooperation and collaboration through an active learning environment were considered essential elements of computer technology. A secondary focus was to utilize computer-integrated instruction to break down curricular barriers in order to enhance opportunities for an interdisciplinary teaching-learning environment.

The heart of the computer plan was the acquisition of appropriate hardware and software necessary for implementation. To accompany the computer integration plan, a long range acquisition plan also needed to be developed. Although the high school principal and the superintendent of schools supported several plans that increased the amount of computer and peripheral hardware and software in the high school, implementation of this magnitude required substantial resources. The original design required each learning station within the high school to have one computer. Each classroom computer was designed to serve as a stand-alone or as a station on a larger network system. Additional equipment was also included to enhance the teaching-learning process and promote the above mentioned learning environment. This originally included a printer, overhead projector and interface to the television monitor in the classroom but was later extended to include CD-ROM and videodisc players. A minimum of one classroom in each curricular area was also targeted to include six computers in order to facilitate cooperative learning and simulation experiences.

To support the technology plan, a backbone network was considered essential. A backbone network provides the infrastructure, or groundwork, of wires, outlets, cables and conduits that permit the placement and operation of computers and other peripheral hardware into each classroom and learning station in the school. The original concept considered the retrofitting, or preparing an existing building for an appropriate network, at Hammonton High School with Type 1 shielded copper wires capable of running 100 megabits of information. A network's speed is measured in megabits; a megabit is one million bits per second. Thus, speed was considered important to support a maximum of information movement throughout the school. "Shielded" means that the wiring will not be vulnerable to such elements as fluorescent lights and radiowave interference. At the beginning of the implementation process, it was felt that this type of backbone network would provide flexibility for future expansion while maintaining a user-friendly environment.

It was realized from the beginning of the action plan that the integration of computers into the curriculum could only be successful if all teachers became stakeholders. Staff development became the critical bridge between formation and implementation of the plan. Although the acquisition of hardware and software seemed paramount, it would only sit idle unless teacher buy-in was planned for and established.

A variety of staff development activities and incentives were designed during the implementation process. Several volunteer computer applications and integration courses were offered to members of the high school faculty. Each course included 18 hours of instruction and rewarded each faculty member with one district credit of continuing education on the salary guide. These courses were designed, initially, to provide practical skills that each teacher could integrate into the operation or management of a classroom. They were also developed to address overall fear and ignorance of computer technology that existed with some teachers, to put technology into human terms and to show teachers how computers could serve them, not vice versa. These courses provided a nucleus of teachers that helped entrench the computer movement at the high school.

Also included in the original action plan were off-site staff development programs and visitations. Staff development was proposed for all members of the high school staff, although a greater amount was originally planned for those teachers and departmental areas infusing computer into the curriculum during the first year of implementation. Preliminary plans included the utilization of the I.B.M. training center in Mount Laurel, New Jersey, and visitations to school districts in the Southern New Jersey area which emphasized computer integration. Three phases of staff development were considered throughout the MARP experience: initial exposure; follow-up training; and one-on-one support.

The original action plan also included the design of a teacher center that would be utilized for teacher training and retraining. It was felt that the center would foster a climate that made the school a center for computer integration, staff development and evaluation. It was also promised that the center would organize computer instruction around critical and creative thinking, cooperative learning, inter-disciplinary learning, information and knowledge processing and active learning. Although the training center was conceptualized to provide instruction for teachers in the high school and, eventually, in the district, the center was also realized as a way to disseminate information and training regarding computer integration to professional staff external to the district. In the original vision, the center was viewed as a place where teachers would not just utilize technology, but they would also design computer-based courses, write innovative high-tech curricula and analyze the results.

Dissemination of information to the community involved two publics, members of the community at-large and parents.

The original action plan concentrated on parental surveys and a parents' night demonstration at the high school. It was felt that unless parents have access to and realize some of the benefits of technology, a computer may be even more frightening to them than to their children or the teachers. It was also realized that the parents provided the main thrust of voter support during the budget election. If the district were planning to invest a sizable portion of the budget and to acquire and implement more computers into the curriculum, it was critical to educate parents and continue their support. A parents' night demonstration seemed to provide the best opportunity for parents to work by themselves. It also provided the time and space to show them they can understand, and even enjoy, technology.

Chronology of Implementation

Five-Year Computer Integration Plan

In addition to the supervisor of math and science and the project manager, the 12 members of the computer integration committee represented the high school faculty, board of education, student population and business community. The faculty and board of education representatives were selected by the project manager because of interest in the project. Faculty members represented the business, science, English, math and industrial arts departments. The high school students were members of the student council and were selected by their peers. Representatives from the business community were selected by the local Chamber of Commerce.

The writer's action plan was initiated with a series of meetings with the computer integration committee in order to communicate the discrepancies in the utilization of computers and solution strategies. During the month of November 1990, two meetings were held. In addition to the task at hand, two outcomes were foremost in the committee process. As leader of the committee, the project manager deemed it necessary to develop trust, cooperation and collegiality among members of the group. In order for a computer integration plan to be realized, a smooth development of the committee process was important.

Prior to the first meeting in November 1990, the project manger disseminated several articles from the literature concerning computer integration, multimedia, integrated instructional systems and future educational uses of computers to members of the committee. Several additional articles were included that dealt with an extended basics in education. The extended basics were a set of skills that provided an infrastructure to curriculum planning. They included: critical and creative thinking; problem solving; collaboration and cooperation; and interdisciplinary instruction within an active learning environment.

Hammonton High School was a member of the South Jersey Regional Library Cooperative, an on-line research search and retrieval service. Through this service, relevant literature was received, reviewed by the project manager and disseminated to the committee members. Committee members were asked to read the literature, paying particular attention to the concepts and ideas. They were also asked to dream about the potentials and possibilities of integrating technology and the extended basics into the high school curriculum. It was felt by the project manager that the articles would also provide a definition of terminology that members could uniformly apply during the planning process.

In November 1990, the computer integration committee met for the first time. Key discussion involved a review of the probable causes to the development of computer-integrated instruction in the high school curriculum. These included the fragmented application of computer staff development, the allocation of financial resources and prior emphasis on improving scores on the High School Proficiency Test (HSPT) for mathematics. Although these points were considered negatives by the committee, realization also indicated that positive things had occurred. Two new computer labs had been installed at the high school, the business department had computerized several courses and the computer applications curriculum developed during the practicum experience had been implemented with great success. Support from the high school principal, superintendent of schools and the board of education was obvious; timing appeared to be appropriate to make significant changes in the way computers were integrated into the total school curriculum.

At the first meeting, the committee also focused on the process of planning. From this discussion, several basic rules were developed:

1) Technology use would be focused on areas where it provided a direct benefit to students based on a defined need.

2) The critical elements of staff training for implementation and ongoing support would be interwoven with the integration plan.

3) Bridges would be developed, or at least addressed, that would connect instruction in the various disciplines of the high school curriculum.

4) Because the time frame for implementation spanned five years, the committee would plan with an eye toward the future. Tomorrow's needs would be envisioned before the committee's plans were implemented today.

Later in November 1990, the committee met again. At the meeting the literature originally disseminated for the first meeting was discussed. After discussion, the committee came to consensus on one broad goal for computer integration. The goal was to improve the teaching-learning process through the maximization of computer-integrated-learning and multimedia experiences under an infrastructure of extended basics in education. Members agreed that the reference to "domain literacy," described by Neudecker (1989), best expressed the "computer as tool" concept. Specific computer software had particular importance to a subject area discipline or domain. These tools should be applied and integrated into the curriculum where appropriate.

After two meetings, the project manager felt confident that the committee process had smoothly developed and that movement toward the development of the plan could begin. Near the end of November 1990, however, an event occurred that changed the scope of the MARP experience.

After a meeting with the superintendent of schools concerning the development of the high school computer integration plan, the conversation focused upon two questions. Although the high school was planning to integrate computers into the total curriculum, wouldn't it be more appropriate to develop a plan for the integration of computers throughout the total K-12 curriculum? And, since the district had entered the 1990's, and because accountability to the community had changed significantly, shouldn't a plan be developed to take the district into the twenty-first century? The project manager was asked to think about both questions and develop a feasibility study. A meeting was scheduled for two weeks later in order to discuss the feasibility of implementation.

During the two-week period, the project manager concentrated on the district's long-range plan and prepared a background statement and preliminary design for the process. Prior to the meeting, the document was disseminated to the superintendent of schools for review. At the meeting, the necessity of the planning process received emphasis. It was decided to address everything that came under the auspices of the school district. Emphasis would be given to the educational concerns of the students "from the womb to the tomb".

A three-step process was identified. First, an assessment had to be made with regard to the current state of each program within the district. Second, after a review of the literature, visions and judgments had to determine what the future state of each program in the district should or could be. And third, recommendations or solutions had to be identified that could address the discrepancies between the two. With this process, Project Education 2000 in the Hammonton School District had commenced.

One additional outcome of the second meeting deserves mention. The project manager serving, as high school vice principal, was offered a promotion within the district. The position, director of special projects, was created. Responsibilities were district-wide, in the office of the superintendent, and primarily included research and development, program and product evaluation, and long-range district planning. The responsibilities also included assisting the superintendent of schools with the operation of the district. The position was included in the budget for the 1990-1991 school year; however, the board of education agreed to adopt the position before the start of the new fiscal year. Within a two-week period, the project manager had a new mission in the district, had broadened the scope of the MARP experience, and had new job responsibilities. The job change became effective on December 10, 1990.

From the start of Project Education 2000, it was realized that many people, both internal and external to the district, needed to become stakeholders if the planning process was to be realized. Ten committees were established to address the needs assessment process. Four committees focused upon specific curricular issues. These included: Language Arts; Math, Science and Technology Education; Social Studies, Foreign Language, Literature and Library Media Programs; and Health, Physical Education, Art, Music and Home Economics. Six committees, ranging from 10 to 15 participants and including administrators, teachers and members of the community, highlighted interdisciplinary concerns and related aspects of the teaching-learning process. The committees included: Special Needs Students; Student Services and Activities; Technology Integration; Early Childhood Education; Post-Secondary and Adult Education; and Human Resource Planning and Development.

Each committee was designed to include administrators, teachers and members of the community. After assessing the current state of each program in the district, the role of each subcommittee was to consult the literature with regard to educational trends. All possible educational developments, augmentations, and continuations were to be examined through community reality and legislative screens. From this process, recommendations or potential solution strategies were to be devised.

A District Advisory Committee (DAC), consisting of 17 administrators, teachers and community members steered the process. The project manager chaired this committee and spoke with potential members about the process and commitment prior to extending an invitation to participate. Each person on the advisory committee was assigned to chair or co-chair one of the ten subcommittees. Because of numbers, the project manager chaired one subcommittee (Technology Integration) and co-chaired another (Human Resource Planning and Development). The District Advisory Committee served as the reference point from which all information concerning Project Education 2000 was disseminated, approved all recommendations as potential solution strategies and served to maintain the integrity of the entire process. All recommendations coming to the advisory committee from the subcommittee were screened for vertical and horizontal impact and for potential benefit to the community at-large. If a recommendation was targeted at improving a program at the early elementary level, what impact could implementation of that program have on other programs at the early elementary level and on the upper elementary level, middle school and high school grades? And, would implementation of this program, in the long term, benefit the entire community?

A connected responsibility of the advisory committee was to assess future personnel needs as well as identify financial resources necessary for implementation of the recommendations. Facilitating and constraining factors for each consideration would also be identified and addressed at this level.

An initial meeting of the District Advisory Committee was held in December 1990. After the background information and project design were discussed, tasks and assignments were specifically defined. It was made clear that much confusion could exist at the beginning of the process. The project manager would attend each meeting of each subcommittee until the process was clear, and the group process was established. After that, the project manager would attend as frequently as possible, or if requested due to a discrepancy or for clarification. Each chairperson or co-chairperson was asked to solicit volunteers from the various groups. To facilitate the group process, subcommittees were designed to include 10-15 members. At the conclusion of the January 1991, subcommittee meetings, attendance rosters revealed that 118 members of the administrative, teacher, student, and community groups had volunteered to serve in Project Education 2000. The entire process was designed for completion in 18 months.

Prior to the scheduled meeting of the computer integration committee in December 1990, the project manager conducted an assessment of the number and types of computers utilized for curricular purposes in the district. It became apparent that the scope of the MARP experience had greatly expanded; computer integration became one area for review and discussion for the technology subcommittee, and technology was one of ten subcommittees in Project Education 2000. Instead of delimiting the computer integration plan to grades 9-12, the integration of computers into the total K-12 curriculum would be addressed. It also became apparent that the plan to integrate computers into the total K-12 curriculum would have to closely align with the mission, beliefs and goals of Project Education 2000. To facilitate the new scope of the study, six additional teachers, three each from the middle and elementary schools, were asked by the project manager to serve on the committee. This brought the number of people serving on the committee to 18. Individually, each new member was apprised of the focus of the committee and the purpose of the planning process. Each member was also provided with the technology and extended basics articles previously disseminated. The project manager felt that this would place everyone on an even basis by the third meeting.

In December 1990, the newly named and expanded technology committee met. The components of the Project Education 2000 planning process were discussed, and the scope of the technology plan was explained. Discussion indicated that the timeline for the plan should be revisited. With the inclusion of two additional schools and limited funding, five years might be insufficient for total integration. The basic rules and goal adopted in November 1990 were revisited for applicability to the expanded study. The committee decided to adhere to these as focal points for the plan to integrate computers. Each would be revisited prior to discussions concerning other technology resources.

The committee also reviewed the current hardware state of the district. The high school contained 75 computers dedicated for instructional utilization. Forty-four of the computers were I.B.M. 30-286 models; these had been purchased within a two-year period and were considered adequate for computer-integrated instruction. Of these, 18 were located in the business lab, 16 in the computer-assisted-drafting lab and 10 in the media center. Ten older Tandy 1000 computers had also been upgraded with memory expansion and were utilized by the mathematics department. One of the art teachers had received a Macintosh computer from a district grant; however, the computer received little utilization due to a lack of preparation and inservice training for the teacher. Twenty Apple IIe computers were still utilized in the basic skills and special education departments.

The middle school contained 27 computers dedicated to instructional utilization, while the elementary school contained 80 computers for the same purpose. Sixteen I.B.M. Model 30-286 computers were contained in the middle school lab. These had also been purchased within a two-year period. Five identical computers were also utilized for basic skills instruction at the middle school, while five Apple IIe computers were still utilized for the same purpose. One of the music teachers at the middle school had also received a Macintosh computer from a grant. Although the middle school music teachers utilized the computer more than the high school art teachers, this was attributed to a much smaller student-teacher ratio as opposed to increased inservice training. Regardless, the computer was not fully utilized.

The 80 computers dedicated to instruction at the elementary school fell into several categories: 40 Tandy 1000 computers were utilized in conjunction with a Josten's Integrated Instructional System, a prescription learning lab for reading, writing and mathematics instruction; 30 Apple IIe computers and 10 Commodore 64 computers were utilized in basic skills instruction and special education classrooms.

The 182 computers utilized in the Hammonton School District spanned four different models and manufacturers. However, utilization of the computers reflected the philosophy of the district to use computers until they were no longer functional or operational. From the discussions of the committee, it was realized that outside of the specific lab applications of the high school and middle school, computers were basically utilized for computer-assisted instruction, or quite simply, low, cognitive-level drill-and-practice with feedback. It was also revealed that a number of professional staff, especially at the elementary school, were confused and somewhat resistant to computer technology because of a lack of teacher input and the number of changes in computer manufacturers. Over a six-year period of time, teachers at the elementary school had exposure to Commodore 64 computers purchased through the local operating budget, Apple IIe computers purchased through Chapter 1 money and Tandy 1000 computers purchased through a combination of the two. Now teachers at the elementary school had heard that all of these would be replaced with some type of I.B.M. computers. Elementary teachers had never received training on any of the computers; in short, the computers were unboxed, set-up, and the teachers were told to use them. These computers had been purchased under the direction of three different people. The teachers asked, "Couldn't one type of computer be selected and couldn't we receive training?"

One additional issue seemed paramount. It was obvious that a district-wide plan for the utilization of computers did not exist. At that time, a fragmented, helter-skelter approach to computer instruction existed with little regard for vertical or horizontal articulation or impact on other grade levels or buildings. The project manager realized that for any computer integration plan to become reality, development and implementation would have to be centralized under one authority.

In December 1990, the writer also contacted several schools in the Southern New Jersey area to request permission for site visitations by members of the committee. After the computer integration project was discussed, dates were established. Arrangements were made for three members of the committee to visit Lacey Township High School, Lanoka Harbor, New Jersey, on January 18, 1991, and for three members of the committee to visit Mt. Laurel Middle School, Mt. Laurel, New Jersey, on January 25, 1991. Arrangements were also made for three members of the committee to visit Stockton State College, Pomona, New Jersey.

Stockton State College had extensive experience and was considered quite diverse in its application of technology to the curriculum. Included in the Stockton portfolio were electronic classrooms, computer conferencing, satellite communications, and computer-integrated instruction in a number of academic areas. Stockton State College also had the largest fiber optics network in the Southern New Jersey area. The Stockton visit was scheduled for February 1, 1991.

In January 1991, the project manager telephoned the Principal of Eagan High School in Eagan, Minnesota, concerning the technology integration plan implemented into the curriculum. At Eagan High School, the focus was not on technology; it was on the teaching-learning process. Computers and other forms of technology were viewed as tools, or part of what was absorbed into the fabric of the curriculum; teachers utilized computers to supplement the critical thinking and problem solving components of classroom instruction. Staff development was also considered essential from two prospectives. First, teachers needed initial training in the function and operation of various forms of technology. With this training, teachers could understand the options available to them that enhanced the teaching-learning process. Second, teachers at the high school found that computers helped them cut their load of daily paperwork. This point was not to be undermined in the attempt to establish teacher buy-in.

Prior to the first meeting in January 1991, the supervisor of math and science and the project manager met with the I.B.M. Systems Engineer from the Mt. Laurel, New Jersey, office to discuss computer integration and multimedia. After discussing the planning process and goals for the integration of computers into the total school district curriculum, I.B.M.'s multimedia software, Linkways, was reviewed. A tentative date was set for February 12, 1991, to demonstrate the software to the entire committee. In closing the meeting, the Systems Engineer indicated that the direction of the Hammonton School District with regard to computer integration was the kind of project in which I.B.M. had interest. As the plan developed, he suggested submitting a proposal to I.B.M. officials in consideration for a school-business partnership.

In January 1991, the technology committee met at the high school. Site visitations were discussed. Nine members of the committee were selected to attend, three each for Lacey Township High School, Mt. Laurel Middle School and Stockton State College, respectively. Although the primary purpose of the visitations was to discuss computer integration and observe available technology, members were prompted to ask questions about implementation, staff development and future plans for the school. What were school authorities most proud of, with regard to computer integration? If one thing could be eliminated, changed or augmented in the interpretation of computers, what would it be? Each member was also instructed to ask: "Did I see anything during the visitation that would enhance the integration of computers in the Hammonton School District?"

The meeting resulted in several additional accomplishments. The results of the meeting with the I.B.M. Systems Engineer were reviewed, and the date of the Linkways demonstration was announced. A discussion aligned the utilization of multimedia and the extended basics, particularly critical and creative thinking and active and interdisciplinary learning. It was acknowledged that multimedia might ultimately be the technological strategy to address interdisciplinary instruction.

The goal established for computer integration at the November 1990, and December 1990, meetings was revisited.

After much discussion, three goals were devised and accepted. The goals were designed:

1) to improve the teaching-learning process through the maximization of educational technology, primarily through the integration of computers into the total K-12 curriculum;
2) to organize computer-integrated instruction and multimedia experiences under an infrastructure of extended basics in education that include critical and creative thinking, problem solving, collaboration and cooperation and self-directed lifelong learning (andragogy) through an active learning environment; and
3) to utilize computer integration, and in particular multimedia, to break down and through curricular barriers and to promote and enhance opportunities for an interdisciplinary teaching-learning process.

On the scheduled dates, members of the technology committee visited Lacey Township High School, Mt. Laurel Middle School and Stockton State College. Based upon conversation with the committee members, the visitations produced encouraging results. In many ways, they tended to validate the efforts of the committee. At Lacey Township High School and Mt. Laurel Middle School, efforts to integrate computers into the curriculum were directly related to ways to enhance critical thinking, problem solving and cooperative learning. Although both schools had a plan to place a computer or computers into every academic classroom, completion of the programs had not occurred. Implementation at Lacey Township High School was on a department-by-department timeline. Implementation started with the business department and proceeded with math, social studies and English. Initial and follow-up staff development augmented the integration plan. Although plans were developed to integrate computers into the fine, practical and industrial arts departments, no plans existed to integrate computers into health and physical education. Thoughts at Lacey Township High School included the application of multimedia; however, no formal plans had been developed. The school had not addressed interdisciplinary instruction.

At Mt. Laurel Middle School, implementation of computer integration occurred on a teacher-by-teacher basis. Emphasis was on selecting teachers who would learn computers, integrate computers into the curriculum, become a stakeholder in the plan, and turn-key, or sell, the integration process to another teacher. A great deal of emphasis was placed upon interdisciplinary instruction and cooperative learning. It was interesting that teachers in different disciplines, who integrated computers into the curriculum, became interdisciplinary partners. It was also interesting that computer labs did not receive a great deal of consideration in Mt. Laurel's technology plan. They believed that student learning should take place at the point of instruction, or in the classroom. The implementation of multimedia had not been discussed at Mt. Laurel Middle School.

Stockton State College, as was expected, was much more advanced in the integration of technology into the curriculum. Every undergraduate course in the science and business departments had integrated computers into the curriculum. The college had extensive fiber-optic cabling which was utilized for computer conferencing, electronic classrooms and downloading satellite programming and teleconferences. Although the intra-campus network was not complete, plans were developed that would network the various technologies for inter-campus, off-campus and international activities to support educational needs of the college and local community.

At the first committee meeting in February 1991, all of the discussion centered upon the site visitations. The visitations validated the specific goals agreed upon by the committee members. The integration of computers into the total school district curriculum should co-exist with the extended basics under an infrastructure of reform and long-range planning. Agreement was also reached that the committee should explore the feasibility of integrating other forms of technology upon completion of the current task. Specifically, the committee was impressed by the report on the Stockton State College visitation. Since the Hammonton School District already had a satellite dish, and had the capacity to download, a fiber-optic connection presented unlimited possibilities for meeting the computer, teleconferencing and retrofitting needs of the school district and the community.

After much discussion, the committee also reached agreement that the plan should include a combination of department-by-department and teacher-by-teacher implementation strategies. Specific departments or grade levels would be targeted for computer integration at some time during a five-year period. This provided the district with the opportunity to vertically align specific subject matter through technology. However, individual teachers, either those who already utilized computers or those who were targeted as impact stakeholders, would be encouraged to participate in a variety of staff development activities structured to integrate computers into the curriculum. The committee also agreed to place a high emphasis on interdisciplinary instruction and cooperative learning; however, the committee recognized that these applications of the extended basics were also strategies designed to improve the teaching-learning process.

Prior to the second meeting of the technology committee in February 1991, the District Advisory Committee of Project Education 2000 had completed its third meeting. Much discussion about the future direction of the district had occurred, and a set of parameters had been developed that promised to maintain the integrity of the process. Included were a mission statement, a set of beliefs and a set of goals.

Although these were viewed as a set of parameters open to continuous review and acceptance, everyone in Project Education 2000 had the opportunity for initial input and discussion. Since the technology subcommittee existed as one of ten subcommittees in the process, the computer integration plan had to closely align with the strategic plan for the district.

On February 22, 1991, members of the technology committee met after school in the computer lab of the high school for the I.B.M. Linkways demonstration. A copy of the multimedia program was available for trial and examination on each computer through the efforts of the I.B.M. Systems Engineer. After an introductory presentation, time was provided for exploration of the tutorial program software features. Although all members of the committee had an awareness of multimedia prior to the demonstration, it wasn't until the presentation that everyone realized its potential impact upon education.

During the demonstration, members of the committee witnessed the operation and interaction of a digitizing camera, CD-ROM, videodiscs and video cameras. The combined efforts of these technologies permitted the incorporation of sound, still images, animation, motion video, film, text and graphics into a small-scale presentation.

Discussion soon lead to teacher-created and customized curricular presentations, student-created multimedia reports and projects, and real-world simulation experiences. The committee realized that, in the process of creating multimedia projects or actively participating in a multimedia lesson, students had the opportunity to critically think, make decisions and solve problems. Discussion indicated that the days of the textbooks, filmstrips, chalkboards and transparencies as sole aids to the teaching-learning process were limited.

The committee met again in February 1991. Two items received primary emphasis during the discussions. The first order of business involved the I.B.M. Linkways presentation from the previous week. It was determined that multimedia had a place to integrate computers into the total school curriculum. However, it was also determined that implementation should concentrate on selected teachers and occur on a teacher-by-teacher basis. Although the committee considered multimedia, and Linkways in particular, user friendly, it was felt that the peripheral technological equipment and investment of time necessary to develop a presentation or report would be difficult to implement without stakeholders. It was decided to provide multimedia exposure to all staff members through staff development and follow-up with incentives and a voluntary program of staff development.

The second order of business involved the mission statement, beliefs and goals of Project Education 2000. The meeting presented the third opportunity for the technology committee to discuss and provide input into the parameters of the long-term planning process. Members of the committee expressed a sense of validation that one of the ten goals of the project specifically targeted technology. The goal was to maximize the utilization of technology as a resource to improve all aspects of education. Of particular interest to the committee were the references, in the belief statements and goals, to the changing role of the teacher from being a transmitter of knowledge to becoming a facilitator of learning. Also of interest were the references to the extended basics and community-wide networks and partnerships. Working within these frameworks, the committee felt that a broad-based computer integration plan could be developed that truly met the technological needs of the school district and community.

Administratively, the decision had already been made to place computers into every classroom or learning environment in the district. The integration of computers into the existing school curriculum was the major focus of the MARP experience. However, if the technology committee intended to devise a plan and spend several million dollars on hardware, cabling, conduits and wiring, a more applicable question emerged. What do we do with these computers when they arrive and are placed into the classrooms? An easy and convenient answer to this question did not exist. However, if the technology committee did not provide direction and an initial reference point for specific curricular purposes and software applications, teachers and principals would not become stakeholders of computer integration.

The committee addressed the question from several perspectives. First, the decision had already been made that computer integration was designed to improve the teaching-learning process and promote the extended basics. Educational software that promised to enhance these goals through low-level tasks of recall, drill and practice, therefore, were not acceptable and would not be considered. The committee needed to focus the professional staff on well-designed software that reflected the curricula taught in the classrooms and maintained vertical and horizontal articulation.

The committee also recognized that different types of software would be needed to enhance different classroom configurations. A one-computer classroom would require different software than a classroom with six computers, which would require different software than a lab setting.

A single classroom computer could help a teacher organize and lead lectures, discussions and presentations in any subject area. With multimedia, presentations designed to support the teaching-learning process were only limited by the creativity and energy of the teacher. A one-computer classroom could also, at times, be used to support cooperative learning groups and manage the administrative burdens that always infringe upon preparation time and teaching. A six-computer classroom was primarily designed to assimilate cooperative learning experiences into the teaching-learning process, while a computer lab enhanced hands-on opportunities for students when the curriculum necessitated a one-on-one student-computer ratio.

Each arrangement would also require a different organization of the teaching-learning process. Although the committee realized that staff development was an essential component for computer operation, it now became even more apparent that staff development was critical to help teachers determine appropriate from inappropriate software and to distinguish one application from another.

In order to promote direction in the software selection process, three members of the technology committee were assigned the task of acquiring and locating software reviews in various professional journals and publisher catalogs. Once these were received and reviewed, requests could be made to secure specific software for preview. The process would enable the committee to establish initial reference points in various curricular areas, maintain records of appropriate software and, in general, facilitate a high degree of accountability with the professional staff. The project manager was quite adamant in the provision of initial reference points. It was beyond the scope of responsibility for this committee to select software for curricular integration. Teachers in the Hammonton School District had a long-standing professional obligation to select the most appropriate materials and supplies for implementing the curriculum. According to the project manager, software selection fell into this category.

The role of the technology committee was designed to develop stakeholders and to provide those responsible for implementation of the curriculum with the skills necessary to select appropriate software. The efforts of the committee would focus upon stimulating discussion about appropriate software within various curricular areas.

As a result of the discussions at the meeting, two additional goals were developed by the technology committee. The goals were designed

1) to support a progressive program of staff development that changes the role of the teacher from being a transmitter of knowledge to becoming a facilitator of learning, ensures professional staff literacy in the application and integration of curricular specific software and develops competency in the use of CD-ROM and videodisc players, digitizing cameras and other innovative technologies, both currently and in the future; and
2) to network one computer, CD-ROM player and videodisc player into every departmental classroom environment within the district (in order to support curricular presentations and interactive lessons and activities) and

> to network a hub of six computers, CD-ROM players and videodisc players into each elementary classroom and at least one classroom environment for each departmental area within the school district (in order to maximize and enhance cooperative learning, problem solving and simulation experiences).

To accomplish this goal in the Hammonton School District, the committee realized a student-computer ratio of 3.5 to 1.

Prior to the meeting of the technology committee in March 1991, the supervisor of math and science and the project director met to discuss a preliminary plan for hardware placement and timelines for implementation. To realize the 3.5 to 1 ratio and to utilize the one computer classroom and hub concepts discussed by the technology committee, in combination with the lab structures utilized at the middle and high schools, full implementation of the integrated plan required 543 computers: 241 computers at the elementary school, 110 computers at the middle school and 192 computers at the high school.

In addition, the creation of teacher centers, based upon a teacher-computer ratio of seven to one, required five and eight computers in the middle and high schools respectfully. The seven to one ratio was developed locally and based upon the number of class periods available during a school day and the average number of teachers having planning and professional assignments during each period.

Thirteen file servers, five each at the elementary school and high school and three at the middle school, were also required in order to network the computers within the buildings. The specific number of computers for each grade level or curricular area included:

Elementary School

Kindergarten - 24

Grade 1 - 42

Grade 2 - 36

Grade 3 - 42

Grade 4 - 30

Grade 5 - 30

Art - 6

Music - 6

Special Education - 19

Enrichment - 6

File Servers - 5

Middle School

Computer Lab - 22

Math - 9

Science - 9

English/Reading - 14

Social Studies - 8

Health and Physical Education - 6

Special Education - 8

Home Economics - 2

Art - 6

Music - 1

Industrial Arts - 8

English as a Second Language - 1

Enrichment - 6

Library - 10

Teacher Center - 5

File Server - 3

High School

Business - 36

Math - 8

Science - 21

English - 40

Social Studies - 9

Health and Physical Education - 16

Foreign Language - 6

Special Education - 9

Home Economics - 2

Industrial Arts - 21

Art - 7

Music - 7

Library - 10

Teacher Center - 8

File Server - 5

The number of computers allocated to each curricular area was governed at the middle school and high school by departmentalization. Since both schools were departmentalized, two or more curricular areas, in some instances, shared classrooms. As a result, several classrooms, selected for location of a hub, served two departments.

The computer lab at the elementary school would continue to support the instruction of teachers in reading, writing and mathematics until these services could be supported by computers in the classroom. At that time, the lab would be disassembled, and the computers placed into the classrooms. By utilizing this approach, one additional computer could be placed into each elementary classroom, grades K-5, or two additional computers could be placed into each elementary classroom, grades 3-5.

The supervisor of math and science and project manager also met with the superintendent of schools prior to meeting with the committee. It was felt that several items needed to be discussed and decisions reached in order to provide guidelines for development and implementation. The first decision was recognized managerial prerogative. For four years, this district had committed to purchasing and utilizing I.B.M. hardware. During this time, the credibility and integrity of the school district and the I.B.M. Corporation had been scrutinized on several occasions. As a result, the district felt very comfortable with the quality of both the product and the service. I.B.M. was also aware of, and supportive of, the school district's plan for computer integration. As of the 1990-1991 school year, a one-vender technology solution had proved beneficial to the district. Consensus was reached that the current hardware vendors would remain the same. It was also decided that the I.B.M. Model 30-286 would remain the computer of choice for the 1991-1992 school year. As hardware advanced and technology improved, specific computer selection, and possibly even the manufacturer, would be reviewed annually.

The second discussion involved a yearly financial commitment for implementation of the plan. Although it was realized that funding sources would be explored and partnerships solicited, it was also realized that the district needed to dedicate a portion of the local operating budget to technology and staff development. Although the State of New Jersey had just revised its school funding formula, and its future was uncertain due to political action, the superintendent of schools committed approximately $200,000.00 each year for implementation of the plan. It was apparent after the meeting that unless supplemental funding for the plan were realized, the plan would require additional years for implementation.

A final discussion involved the centralization of technology in the district. No one in the district officially had been designated with the responsibility to coordinate the computer programs, although the project manager was considered the driving force in the district for past computer efforts. The approach for hardware and software acquisition still seemed helter-skelter. With a plan of this magnitude, coordination of purchasing, procurement, set-up, maintenance, evaluation, repair, replacement, initial training and follow-up training was vital and necessary. The district had never before committed such a financial investment to any one reform movement in the teaching-learning process. It appeared that the district had reached a critical point.

If the plan to integrate computers into the total school curriculum was to come to fruition, someone needed to take charge and assume responsibility. Although it was realized that the district could not create another administrative position due to perception and public outcry, if a restructuring of the current administrative staff occurred, a new position could be designed: supervisor of educational technology. Although the superintendent of schools did not commit, the urgency of the situation was conveyed, and an interest was created. The superintendent of schools indicated he would give the proposal serious thought. He also indicated that he would like to talk again about the proposal.

During March 1991, and April 1991, four meetings of the technology committee were held. All of the meetings focused upon development of the computer integration plan and the order of implementation. The preliminary plan for hardware acquisition, based upon the adopted goals and the report of the supervisor of math and science and the project manager were presented and discussed. Results of the meeting with the superintendent of schools were also highlighted.

Several things were brought to the attention of the committee at the first meeting. During the first year of implementation (1991-1992), a second lab at the high school had to be assembled, and the lab at the middle school had to be expanded. Both prospects existed as components of a previous plan, and now were incorporated into the computer integration plan. The committee agreed that the first year of implementation should emphasize the middle school and high school. The Josten's Prescription Learning Lab was still considered something of a novelty at the elementary school; many teachers were still apprehensive about computers. In addition, under the contract, teachers at the elementary school were entitled to 20 hours of inservice training. It was decided to focus the plan during the first year of implementation on prescription learning and, in particular, to align the integrated instructional system with the elementary curriculum in reading, writing, language arts and mathematics. A secondary focus of the plan would provide initial exposure through staff development in computer-integrated instruction and multimedia. The committee felt that because of its history with computers, and due to the apprehension of the teachers, this became the best plan of action at the elementary school.

Terminology was considered important. When referring to a single classroom network, including a computer, CD-ROM and videodisc, the term "classroom learning station" was established. A "hub learning station" referred to the departmental learning environments, including six computers, CD-ROM's and videodiscs. The committee decided that one printer would be sufficient for each learning station, regardless of designation as a classroom or hub. A single classroom printer would be connected to the computer while computers in the hub learning station would utilize a printer switch box. In each hub, the printer was designed for utilization on a first come, first serve basis.

The incorporation of six CD-ROM and videodisc players in each hub learning station deserves mention. The committee discussed two methods of incorporation. According to the I.B.M. Systems Engineer and the literature, each computer would require its own CD-ROM and videodisc player in order to maximize multimedia and simulation experiences. The decision became one of space availability and location. Peripheral hardware could be located in the classroom, or it could be located adjacent to the file server. Placing approximately 40 CD-ROM and videodisc players in the same location with a file server required substantial space.

If the CD-ROM and videodisc players were placed at the location of the file server, it would also become necessary for someone to load the appropriate software and discs prior to utilization. This meant that it would be necessary for someone to install the necessary software into each CD-ROM or videodisc player in operation during each period of the day. The committee concluded that the burden of these methods of implementation was unthinkable. Peripheral hardware would be located in the classroom or hub with each computer or computers. Software and disc management would become the responsibility of each teacher. A central storage area would be located in the media center of each school for specific curricular software not installed in a file server and CD-ROM and videodiscs. Teachers would sign-up and check-out these items as necessary.

At the second meeting in March 1991, the concept of the classroom and the hub learning stations, and, specifically, the integration of CD-ROM and videodisc players, was revisited. Several of the members expressed the feeling that the level of technology addressed by the peripheral hardware was too sophisticated for teachers at the middle school and elementary school. The project manager felt strongly about the potential contributions of CD-ROM and videodisc players in the school curriculum. However, the concerns expressed by the members of the committee were warranted and accepted.

Teachers at the high school for the most part were more receptive and enthusiastic about the integration of computers into the curriculum. The high school was also more advanced by virtue of the number of computers and amount of staff development received by teachers in several departments. On the other hand, only a few teachers at the middle school and elementary school had initial exposure to computer technology. Fewer still had an awareness of computer applications and integration.

After much discussion, a compromise was achieved. Classroom and hub learning stations at the high school would include CD-ROM and videodisc players. Only computers and printers would be included in the classroom and hub learning center at the middle and elementary schools. Concentration at grades K-8 would emphasize computer-integrated learning through domain specific software. The committee agreed that the goals established for the computer integration plan should remain. Everyone on the committee was convinced that CD-ROM's, videodiscs and multimedia would become essential parts of the technological curriculum. Everyone was also certain that with the passage of time, most teachers would develop a level of comfort with computers. At the appropriate time, the plan could be amended to include CD-ROM and videodisc players at the middle and elementary schools.

Initial plans at the middle school for 1991-1992 indicated that the lab would be expanded from 16 to 22 computers during the first year of implementation. Keyboarding and Microsoft Works, an integrated computer applications program of word processing, spreadsheet analysis and database management, were taught to all students in the sixth, seventh and eighth grades as part of a cycle program. By increasing the number of computers in the lab, a one-on-one student-to-computer ratio could be maintained. It was decided that nine computers would be placed into the science department, one computer in each of the three classrooms and six computers into a hub, shared with the English department; one computer would be placed into the art classroom; one computer would be placed into the industrial arts shop, and ten computers would be placed into the library. A second file server, an I.B.M. Model 90, would also be placed into the library. The committee felt that the file server would initially network the ten computers in the library and over the course of the integration plan, connect to all classroom computers as well. Two computers were also dedicated for placement in a teacher center.

Initial plans at the high school for 1991-1992 indicated that a second lab of 18 I.B.M. Model 30-286 computers would be established. With the success of the computer applications curriculum, plans were underway to completely computerize each course in the business department. A second lab was essential to bring this to fruition. The second lab would be located adjacent to the first lab, only separated by a non-instructional room of approximately 250 square feet. Both labs would be networked to the I.B.M. Model 80 file server. Another lab, containing 12 computers, would be created and located at the back of the biology lab.

During the initial year of implementation, this lab would primarily be utilized with biology classes in place of specimen dissections. It was felt that the conceptual understandings of biological dissections could be presented through computer simulations. Learning to use a scalpel skillfully was a skill considered beyond the scope of a high school curriculum in the biological sciences and reserved for a major field of study at the postsecondary level. It was also decided that the high school science teachers would explore software to integrate computers into the physics, chemistry and organic chemistry curricula.

An interesting side effect of the science lab deserves mention. It was understood that the creation of the lab would be cost effective for the district. Over a three-year period, the expenditure for the lab would actually equal the expense incurred by the district for disposal of lab specimens and formaldehyde. Lab specimens and formaldehyde were considered hazardous waste materials by the Environmental Protection Agency; cost for disposal had increased substantially over a five-year period. This became the committee's and the district's first experience with the nature of computer acquisition and justification as cost effective.

In addition to the labs, two computers were placed into the room separating the business department labs in order to initiate a teacher center. Conceptually, the center was regarded as a place where teachers could complete classroom management functions, review software or create specific lessons on the computer. It was felt that the teachers needed a separate place to practice and refine computer skills. It was also felt that the one-on-one component of staff development would be enhanced if non-technical teachers realized they could learn computers without being watched by students or experienced teachers.

Plans were also developed for the remainder of the five-year plan to integrate computers into the total school curriculum. Developments for the 1992-1993 school year through the 1995-1996 school year included the following classroom and hub learning stations and individualized computer locations:

1992-1993

Elementary School

Kindergarten - four hub learning stations;
Grade 1 - seven hub learning stations; and
Grade 2 - six hub learning stations.

Middle School

Math - one hub learning station and three classroom learning stations; and
Teacher Center - five computers.

High School

Math - one hub learning station and two classroom learning stations;
Science - one hub learning station and three classroom

learning stations;

Teacher Center - five computers; and

File Server - two computers.

1993-1994

Elementary School

Grade 3 - seven hub learning stations;

Grade 4 - five hub learning stations; and

Grade 5 - five hub learning stations.

Middle School

English - two hub learning stations and two classroom learning stations; and

Social Studies - two classroom learning stations.

High School

English - two hub learning stations and four classroom learning stations; and

Social Studies - one hub learning station and three classroom learning stations.

1994-1995

Elementary School

Special Education - two hub learning stations and seven classroom learning stations;

Enrichment - one hub learning station; and

File Servers - three computers.

Middle School

Special Education - one hub learning station and two classroom learning stations; and

Enrichment - one hub learning station.

High School

Special Education - one hub learning station and three classroom learning stations;

Writing Lab - 24 computers;

Foreign Language - one lab learning station; and

File Server - one computer.

1995-1996

Elementary School

Art - one hub learning station;

Music - one classroom learning station; and

File Server - one computer.

Middle School

Health Education - one hub learning station;

Home Economics - two classroom learning stations;

Art - five computers;

Music - one classroom learning station;

Industrial Arts - seven computers;

English as a Second Language - one classroom learning station; and

File Server - one computer.

High School

Health - one hub learning station;

Physical Education - ten computers;

Home Economics - two classroom learning stations;

Art - one hub learning station and one classroom learning station;

Music - one hub learning station and one classroom learning station;

Industrial Arts - three classroom learning stations; and

File Server - one computer.

At the final meeting of the committee in April 1991, the planning process goals and implementation order were revisited. Integrity with the mission statement, beliefs and goals of Project Education 2000 was also discussed. The decision to concentrate on the goals and implementation order developed during the planning process was reaffirmed by the technology committee.

The committee process was also discussed at the meeting; consensus indicated that the efforts of the project manager to develop trust, cooperation and collegiality were successful. In fact, most comments centered upon the common bonds or closeness that developed during the six-month period.

Acquisition of Hardware and Software

Without adequate hardware and appropriate software that articulated with and supported the curriculum, it was realized that the computer integration plan would surely become a document to occupy space on a shelf and gather dust. It became apparent that a companion plan should be addressed. Another component of the MARP experience, therefore, became the development of strategies for the acquisition of hardware and software.

From the first meeting of the technology committee, the most repetitive question regarding the integration of computers into the curriculum was, "Where are we going to get the money to do this?" Although the superintendent of schools had agreed to make computers a budgetary priority and commit approximately $200,000.00 a year to the project, the committee realized that much more money would be required for the plan to come to fruition. The committee agreed early in the planning process to confront the financial barriers to computer integration and eliminate, or at least reduce, possible technology paralysis. The other alternative was to extend the timeline for implementation. Although it was realized that funding remained a responsibility of the administration, several elements, in addition to budgetary allocations, were discussed by the committee. Expenditures related to curriculum and the teaching-learning process could be reallocated to computers. In some cases, computer costs might be no greater than the current expenditures for the items that computers were replacing. The district's mini-grant program could be redesigned to include discretionary grants targeted towards computer integration. Instead of permitting open-ended innovation, the scope of the program could be narrowed to computer technology. Creative financing was also discussed by the committee. Possibly, large-scale purchases could be made during the first or second year of the plan and paid for over a five-year period. State, federal and foundation grants could be explored. And finally, the district could explore the feasibility of a school-business partnership.

Parameters regarding the acquisition of software were established in January 1991, at a meeting of the District Management Team (DMT). The DMT consisted of seven members: the superintendent of schools, director of special projects, director of curriculum and instruction, school business administrator, high school principal, middle school principal and elementary school principal. Monthly meetings were held and arranged so that relevant concerns and issues concerning the district could be discussed. It was through this avenue that long-term and future directions of the district were discussed and decided. A goal of the project manager was to utilize the DMT and keep all of the major decision makers in the district informed about the process of the technology committee.

At the meeting, the preliminary goals and stages of the computer integration plan were discussed. After a brief report concerning hardware, three issues regarding software emerged. They included: responsibility for software selection; acquisition of software; and adherence to legal and ethical standards. It was decided that, although the technology committee would be involved in the software selection process, teachers in the various curricular areas would assume primary responsibility. The role of the technology committee would be limited to researching, consulting, and in many ways, cheerleading. Teachers in the district had responsibility for textbook selection and for the procurement of instructional materials and supplies. Members of the DMT agreed that software should also be considered as a product utilized in the teaching-learning process.

After the agreement, discussion focused upon staff development. In order to make sound decisions, supervisors and teachers required a well-designed staff development program to help them determine good from bad, and appropriate from inappropriate, software. In addition, it was decided that staff development activities should also address the extended basics. Specific curricular software that enhanced these skills should be given priority for integration into the curriculum. The committee concurred that since implementation of the plan was phased over a period of five years, training in software selection could be coordinated with the same timeline.

The discussion concerning software acquisition focused primarily upon funding. If the integration of computers into the total school curriculum was a district priority, software also became an essential priority. In the Hammonton School District, principals maintained a high degree of autonomy for line item purchases in the budget. It was decided that principals would reanalyze their budget priorities and dedicate funding to the procurement of software. The principals discussed the possibility of utilizing the textbook or instructional supplies accounts in order to provide adequate and appropriate software.

It was also decided that the technology committee would solicit catalogs from the various software vendors. Software from the catalogs would be reviewed and evaluated, whenever possible, and the information would be disseminated to the instructional supervisors. At the recommendation of the project manager, a four-question summary for software evaluation was agreed upon. The questions included:

1) Does the software meet a specific curricular need?
2) Does the software allow some aspect of the curriculum to be presented more effectively or efficiently?
3) Is the software user friendly?
4) Does the software have other potential uses, and is it interdisciplinary?

The issue of software ethics and copyright compliance was also addressed at the meeting. If teachers see administrators or if students see teachers making or using illegal copies, installing one software program onto multiple computers or even using the legal backup disc along with the original when the backup is intended for archival purposes only, the message would be sent that software piracy was acceptable, as long as one didn't get caught. Everyone needed to learn that copyright compliance was vital and that the implications for violation were significant. Members of the DMT agreed that the building principal was responsible for establishing, communicating and enforcing copyright practices within each building.

Another element considered for the acquisition of hardware and software was the district mini-grant program. The mini-grant program was created during the 1988-1989 school year by the superintendent of schools in order to encourage and promote innovative educational projects and programs. For three years, the board of education dedicated approximately $50,000.00 a year to this fund. Teachers were invited to submit proposals for mini-grants by the end of January for the current school year, or after January for the following school year. Written proposals were designed to include a project or program rationale, goals and objectives, learning strategies, instructional materials, anticipated outcomes and approximate cost for implementation. From the inception of the program, mini-grants were funded to promote and enhance cooperative learning, cultural sensitivity, parental involvement, dropout identification and critical thinking skills.

In February 1991, the project manager met with the superintendent of schools and the director of curriculum and instruction to discuss the mini-grant program. In order to enhance the acquisition of hardware and software and bring the computer integration plan to fruition, the project manager proposed discretionary funding for the mini-grant program.

Discretionary funding was explained as narrowing the focus of the mini-grant program so that all, or at least most of, the money available for grants would be targeted for innovations in technology. By delimiting the scope of the proposals, the district had the opportunity to move the district in a particular direction. In this case, the movement would be technologically-based.

After discussion, the superintendent of schools indicated that a portion of the money in the mini-grant program would be dedicated to technology. However, the entire account would not target computer integration. Although the superintendent felt strongly about computer integration, he felt equally strongly about instructional innovation. At least half of the available funds should remain open-ended. In order to truly promote innovation, all proposals that enhanced the teaching-learning process and student achievement would continue to be considered.

In April 1991, six teachers submitted mini-grant proposals for computer integration projects. At the high school, one teacher of home economics and one teacher of industrial arts submitted proposals. Two English teachers submitted proposals at the middle school, while two fourth grade teachers submitted proposals at the elementary school. It was interesting that two of the six teachers were members of the technology committee, while five of the six teachers also participated in Project Education 2000.

In May 1991, grants ranging from $2,500.00 to $3,800.00

were awarded to the six teachers. Each proposal was designed for a one computer classroom. The computer selected for utilization in the six proposals was an I.B.M. Model 30-286. According to the proposals, a computer provided the opportunity to develop a new innovative way to deliver instruction in an already existing curriculum. In addition to Word Perfect 5.1 and Lotus 1-2-3, the mini-grant awarded to the teacher of home economics included software designed for cooperative learning groups in family living and nutrition.

The proposal submitted by the teacher of industrial arts included a CAD (Computer-Assisted Drafting) program for the development and design of products in a power mechanics classroom. The purpose was to familiarize students with the role of technology in industry. The proposal indicated that, eventually, this computerized learning station would be networked into the CAD lab.

At the middle school, both proposals included Word Perfect 5.1 with Windows and Page Maker. Both teachers intended to use the software for individual and cooperative creative writing projects. It is also important to note that the teachers shared responsibility for the middle school monthly newsletter and the yearbook. With a laser printer in each classroom, the journalism club at the middle school had the capability and opportunity to produce the newsletter internally and to complete most of the design for the yearbook in house. The teachers also indicated a desire to open a process for the production of banners, posters and pamphlets for special events during the school year.

At the elementary school, the proposals submitted by the fourth grade teachers highlighted Logo and interdisciplinary instruction in language arts, math, social studies and science. Logo provided an opportunity to integrate critical thinking and problem solving skills into the curriculum.

At the end of February 1991, the project manager met with the superintendent of schools. The purpose of the meeting was to discuss additional ways to acquire hardware and software for the computer integration plan. Primarily, consideration was given to grant writing; however, the development of an educational foundation to support a variety of educational initiatives was also discussed.

Most of March 1991 was spent reviewing the grant-writing process and locating specific grants dedicated to technology and computer integration. During the first week of March 1991, the project manager spoke with the Coordinator of Educational Technology, New Jersey Department of Education, concerning the grant writing process. He stated that the most important part of the process was coming up with a unique idea that provided a solution to a problem. Innovation and replication were critical.

A five-step model for grant writing was suggested:

1) Specifically define the problem.

2) Determine a reasonable course of action.

3) Identify the major issues or factors bearing on the problem.

4) Analyze each issue or factor and identify courses of action.

5) Make a decision and select the best alternative.

Since the project manager had no prior experience in competitive grant writing, the decision was made to limit the number of grant applications for the first year. After a search for available grants and deadlines for submission, two grants were addressed. The first grant, U.S. Department of Education, Innovation in Education - Computer-Based Instruction, announced funding for a period of three years. The grant targeted projects that developed strategies for the integration of computers into the school curriculum and promoted approaches that effectively used computers to improve instruction. It encouraged plans that could be replicated. The level of funding depended upon the scope of the project; the range for the previous year was $50,000.00 to $350,000.00. Deadline for submission was May 3, 1991.

The second grant, Teaching Essential Life Skills (TELS), was funded by the New Jersey Department of Education. The grant was limited to educational programs from kindergarten through sixth grade and highlighted creative thinking and problem solving skills in an educational environment. Technology was viewed as an important component of an integrated approach to improving reading, writing and computation skills. According to the Request for Proposal (RFP) a maximum of ten grants would be awarded; each award was $130,000.00. Deadline for the grant was April 12, 1991.

Although the project manager missed a technical assistance workshop for the TELS Grant, on March 12, 1991, a team consisting of the director of curriculum and instruction, elementary school principal, two members of the elementary school staff and technology committee and the writer, met and discussed the grant. A proposal was discussed, assembled, reviewed and revised two times by April 5, 1991. The proposal was approved by the Board of Education at its first meeting in April 1991, and submitted to the New Jersey Department of Education by the due date. On June 6, 1991, results of the TELS Grant proposal were returned to the district. A minimum score of 65 was required for funding consideration. The proposal submitted by the Hammonton School District received 64.7 points.

Despite the fact that the district would not receive funding for the 1991-1992 school year, and despite an obvious letdown, the team still realized a sense of accomplishment. An evaluation of the proposal was requested by the project manager in the hope that lessons could be learned and mistakes avoided if the district submitted a proposal in 1992-1993.

On April 3, 1991, the supervisor of math and science and the project manager attended a technical assistance workshop for the Innovation in Education - Computer-Based Instruction grant. The workshop was sponsored by the Honorable New Jersey Senator, Frank Lautenberg, in Newark, New Jersey. During the following week, the technology committee met to discuss the workshop and to discuss an initial draft for the proposal. Three subcommittees were developed, and each was assigned responsibility for incorporating the computer integration plan into the proposal design. It was agreed that each subcommittee would submit the appropriate portion of the proposal to the project manager by April 22, 1991. This timeline provided an opportunity for review and revision prior to submission to the Board of Education for approval at the regularly scheduled meeting on the last Thursday of the month.

A setback for the grant proposal occurred on May 10, 1991. While reading Education Week (May 8, 1991), the project manager discovered a small article dedicated to the U.S. Department of Education, Innovation in Education grant program. The article announced that program funding had been reallocated into programs designed to support the America 2000 initiative. In short, the competitive grant for computer-based instruction was no longer available for the 1991-1992 school year.

After reading the article, the project manager telephoned the Office of Educational Research and Improvement, U.S. Department of Education. The conversation confirmed the statements from the article. Members of the technology committee were informed individually, and several days later, collectively.

Needless to say, a sense of disappointment prevailed. After discussion, however, a realization also occurred that a quality funding proposal could be put together. This had been the first experience for anyone on the technology committee to participate in a competitive grant writing proposal. Subcommittee work on the proposal was terminated and each section was filed with cautious anticipation for funding during the 1992-1993 school year. (It should be noted that competitive funding for the grant was also suspended for the 1992-1993 school year.)

It was at this point, more than any other, that the project manager realized the amount of buy-in from the technology committee for the computer integration plan. Plainly, the committee refused to let these setbacks diminish their enthusiasm for the project. Specifically, members of the subcommittee were determined to make the plan work. If these grants did not come to fruition, other grants would be located and proposals would be submitted.

After meeting with the superintendent of schools in February 1992, and discussing the acquisition of hardware and software, the project manager set about the task of gathering information on educational foundations. After initiating and receiving two literature searches and talking with representatives from four school districts in the Southern New Jersey area with foundations, a proposal was written. The purpose of the educational foundation was to raise money to supplement school revenues and to support various programs and initiatives of the district. Although the project manager realized that a number of educational initiatives could and should be funded through a foundation, the initial emphasis was designed to target primarily computer integration. After all, the concept of an educational foundation in Hammonton originated from discussions on additional ways to acquire hardware and software to support the computer integration plan.

In May 1991, the proposal was presented to the Education Committee of the Board of Education for review. The project manager stated that the Hammonton Education Foundation would be a non-profit, tax-exempt entity developed to attract, manage and disseminate funds to financially support the current and future educational needs of the Hammonton Public Schools.

A timeline of six months was proposed for operational start-up. This included selection of a board of trustees, development of purpose and goals, submission of appropriate applications for Federal and State requirements and establishment of funding priorities. Approximately one year was targeted for successful implementation. In addition, the project manager proposed that a consultant be contracted to lead development of the foundation process.

In July 1991, the Hammonton Board of Education approved the proposal to develop plans for the Hammonton Education Foundation. A consultant was contracted in September 1991, to lead the developmental process and facilitate implementation. By February 1992, the Hammonton Education Foundation was operational and ready to identify and cultivate various funding sources. The president of the board of education and the superintendent of schools served on the inaugural 18 member board of trustees. Under their persuasion, mini-grants for computer integration were targeted by the trustees for primary emphasis during the first year of operation. By June 30, 1992, the foundation had remarkably generated $11,500.00 in contributions from graduates of Hammonton High School. Requests for grant proposals were targeted for July and August 1992. Implementation was proposed for the 1992-1993 school year.

Perhaps the largest and most ambitious project related to the acquisition of hardware and software was the proposal for a school-business partnership with the I.B.M. Corporation. After meeting with the I.B.M. Systems Engineer in January 1991, and reviewing Linkways, the supervisor of math and science and the project manager discussed the possibility of a school-business partnership. Although the specific plan to integrate computers into the total school curriculum was not complete, all of the concepts and goals were established. The thought emerged: "Perhaps the development of a proposal for a partnership with the I.B.M. Corporation could parallel the development of the five-year plan?"

Within three weeks, a matching grant proposal was designed. The grant included provisions for initial training and follow-up staff development, hardware and software acquisition, computer integration and replication. Specifically, the Hammonton School District and the I.B.M. Corporation would contribute an equal dollar amount. The grant specified that ten K-12 teachers in the district would be selected by proposal to receive 60 hours of staff development in specific curricular software and multimedia at the I.B.M. training center in Mt. Laurel, New Jersey. Staff development would occur during the summer months and be provided by I.B.M. selected trainers. In return, the Hammonton School District would provide renumeration to each teacher at the summer per diem rate according to contract and award each teacher four district continuing education credits toward the salary guide.

When the teachers returned to school in September 1991, each classroom would be equipped with one I.B.M. Model 30-286 computer, a color monitor, an I.B.M. Proprinter, a CD-ROM player and an overhead projector. In addition, each teacher would be provided with I.B.M. Linkways and, if financial resources permitted, additional software or CD-ROM discs for integration into the curriculum.

During the course of the school year, each teacher selected for participation in the matching grant proposal would be required to provide a minimum of 18 hours of training to one teacher in the department or grade level. After documentation of the training by the project manager, the teacher receiving one-on-one training would receive one district continuing education credit on the salary guide. These teachers would also receive strong consideration for participation if the grant were to be replicated in the succeeding year.

In February 1991, the project manager telephoned the I.B.M. Systems Engineer and arranged a meeting to discuss the feasibility of the proposal. The scope of the computer integration plan and parameters of the matching grants proposal were revisited; the systems engineer also indicated that he thought it would be advisable to include the marketing representative and regional workstation specialist at the meeting. The systems engineer also indicated that the proposal might be too limited. He suggested opening the entire computer integration and multimedia plan to an I.B.M. proposal. To his knowledge, very few school districts had plans to integrate computers across the total school curriculum, and fewer still, even had an idea of how to go about developing and implementing a plan. The systems engineer indicated that I.B.M. wanted to market its multimedia software in the educational area. The visions of the Hammonton School District might offer just the avenue I.B.M. desired in order to make a partnership possible. Needless to say, the project manager felt great exhilaration while talking with the I.B.M. Systems Engineer. However, for the integrity of the process, it was necessary to remember that the systems engineer was employed by I.B.M., and I.B.M. was in business to market and sell its products. A meeting date was established for March 14, 1991.

Near the end of February 1991, the supervisor of math and science and the project manager met with the superintendent of schools to discuss the meeting and extend an invitation to attend. Since the purpose of the meeting was fact finding and exploratory in scope, the superintendent of schools declined the invitation. Although I.B.M. Corporation's potential contribution to the Hammonton Public Schools was without question, it was also deemed necessary to focus upon the district's contribution to I.B.M. First and foremost was the linear relationship between the visions and goals of the district with regard to computer integration and multimedia, and the educational vision and goals of the I.B.M. Corporation. Second, and of equal importance, was the district's past commitment to I.B.M. The image of the school district in the Southern New Jersey area was exceptional; Hammonton's public schools had relatively little turn-over in staff from year-to-year and a large file of resumes from prospective applicants.

Additionally, the district was willing, and indeed welcomed the opportunity, to open its doors for visitations from other school districts and to offer assistance in plan development and training in computer integration and multimedia. The location and proximity to all parts of Southern New Jersey, and even to all of New Jersey and Southern Pennsylvania, was good; the environment and atmosphere of each school in the district was pleasant and clean. Discussion also indicated that it would be to the district's benefit to take the I.B.M. representatives on a tour of each school in the district.

On the arranged date, the supervisor of math and science and the project manager met with the I.B.M. representatives. After the visions and goals of the Hammonton School District were outlined, I.B.M.'s interest and definition of a school-business partnership were discussed. The representatives were helpful and explained that, as expected, I.B.M. would look at its current and future needs and anticipate what it expected to gain from a partnership. The corporation would also look at the commitment of the district in bringing its vision to reality.

I.B.M.'s Regional Workstation Specialist was especially interested in Hammonton's vision of becoming a computer integration and multimedia training center for the Southern New Jersey area. To his knowledge, this had never been done for educational purposes in the Middle Atlantic region.

The matching grants proposal was also discussed. Although it was indicated that the proposal could come to fruition and should be approached as a supplement, the representatives urged the district to enlarge the scope and submit a proposal for a partnership based on the big picture. It was apparent at the meeting that, at least from the three I.B.M. representatives in attendance, a great deal of interest was generated in the potentials of the project. The supervisor of math and science and the project manager were invited to Philadelphia, Pennsylvania, to further discuss the partnership proposal. In addition, the systems engineer and marketing representative also indicated their desire to set up a meeting with the Education Director for the State of New Jersey. Following through on both meetings was considered beneficial for the district. If a partnership proposal was endorsed by the New Jersey Education Director, the proposal was then forwarded to the Regional Office in Philadelphia, Pennsylvania, for similar endorsement. At this point, the proposal could be forwarded to I.B.M.'s National Education Center in Atlanta, Georgia. As explained by the representatives, ultimately, Atlanta made the final decision.

The meeting ended with a tour of the three schools in the district. Although the systems engineer and marketing representative were well aware of the volume of hardware purchased by the high school and middle school, the regional workstation specialist had never been to Hammonton. It was considered important for the representatives to see the curricular applications of computers and to witness the climate and environment of the schools. In an attempt to sell the school district as a potential I.B.M. partner, the supervisor of math and science and the project manager also asked the representatives to consider all possibilities as the buildings were toured. Suggestions or comments were welcomed, although none were received.

As the day's activities ended, the representatives indicated that they would contact the project manager when arrangements were made for the meetings. Dates and times would be mutually agreed upon at that time.

Feedback for the superintendent of schools was provided several days later. Within a week, a meeting was held with the Education Committee of the Board of Education in order to discuss the vision and goals of the computer integration plan. Three of the four committee members were involved in Project Education 2000 and were familiar with the work of the technology committee. Results of the meeting with the I.B.M. representatives were reviewed; members of the committee indicated approval for efforts to attract a school-business partnership to the Hammonton School District. With their approval, Project PACITT (Partners Advancing Computer Integration for Today and Tomorrow) was initiated.

Through several telephone conversations during the following week, visitations to the I.B.M. offices were scheduled. A meeting with the Education Director for the State of New Jersey, was scheduled for April 9, 1991, in Mt.

Laurel, in order to discuss the district's visions and goals for computer integration and multimedia and the partnership proposal. The date of the meeting was arranged to coordinate with a staff development program in computer integration designed for the teachers of Hammonton High School. The program was also conducted at the I.B.M. training center in Mt. Laurel, New Jersey. A meeting was also scheduled with a executive from the I.B.M. regional office, Philadelphia, Pennsylvania, on April 17, 1991, for the same purpose.

At the meeting on April 9, 1991, the project manager discussed a vision about the role of computers and related technologies in education. Although emphasis was placed upon computer-integrated instruction and multimedia, discussion also focused upon the district's work with Project Education 2000. I.B.M.'s education director was interested in the extended basics, the changing role of the teacher and the influence of technology on the teaching-learning process. The discussion revealed agreement that in order to maximize the impact of technology on the teaching-learning process, computers would eventually move from the lab to the classroom.

Several additional items were discussed at the meeting. When asked about a design or structure for an I.B.M. proposal, the education director outlined an eight-step process. Proposal sections included: a problem statement; district background; current state of the district; long-range goals; district commitment; I.B.M. expectations; anticipated outcomes; and evaluative criteria. Although I.B.M. did not specify a formal structure, these components had institutionalized over time.

The education director also indicated that proposals could be forwarded directly to Atlanta, Georgia, from the local office. It was not necessary to obtain approval from the regional office. With regard to a partnership with the Hammonton Public Schools, the education director expressed a great deal of interest in, and agreement with, the vision and plans of the district. He encouraged the project manager to formalize the proposal over the next several months and send it directly to him. Once received and reviewed, another meeting would be scheduled to discuss the impact of a partnership. If accepted and approved by the Atlanta office, the partnership could become effective for the 1992-1993 school year. However, he also indicated that partnership proposals were moving through I.B.M. at a slower pace due to rumors of a major corporate reorganization. At this point, I.B.M.'s Educational Systems division was in a state of flux.

It was obvious that the meeting produced a great deal of positive and some potentially negative information. Interest had definitely been generated, though in reality, the timing might be inappropriate. However, there was no question; too many stakeholders had bought into the concept. The project manager would work with the technology committee to develop a formal proposal. At this point, the writer judged that the committee could work three projects at one time. These included finalizing the computer integration plan, developing a major grant proposal and assembling a proposal for a school-business partnership.

It was interesting that the meeting at the I.B.M. regional office was canceled several days prior to the scheduled date. No definite reason was given for the cancellation. A meeting was never rescheduled although the project manager learned approximately three months later that the regional workstation specialist had fallen ill and was eventually transferred to another regional office.

After reviewing the results of the meeting with the superintendent of schools, and eventually, the Education Committee of the Board of Education, the project manager set about the task of developing a formal proposal for a school-business partnership with the I.B.M. Corporation. By this time, the five-year plan to integrate computers throughout the total school curriculum had been completed, and funds for the Innovation in Education - Computer-Based Instruction Grant had been reallocated. Although the technology committee was in the process of reviewing and discussing distance learning and fiber optic technologies as part of Project Education 2000, the members unanimously voted to become part of the partnership process.

Because of time and other responsibilities of the committee members, it was agreed that the supervisor of math and science and the project manager would take responsibility for writing initial drafts of each section of the proposal. It was also decided that each section would be disseminated to committee members prior to a meeting for review. Each section would be discussed and revised or augmented as necessary at the meeting. Through this process, the draft served as an initial reference point for discussion; results of the conversations were reflected in revisions. As the process concluded, the entire document would be open to discussion and revision until approved by the technology committee. Once approved, the proposal would be reviewed with the superintendent of schools, the Education Committee of the Board of Education and eventually, the Board of Education.

Although three meetings were held in May and June 1991, the partnership proposal remained incomplete. Of the eight components, four were completed and approved by the committee. With all members of the technology committee except the project manager off during the summer months, the writer intended to finalize the initial drafts for each of the remaining sections prior to September 1991. This task was accomplished and by October 1991; the committee had completed its work on the proposal. Project PACITT was formally approved by the Board of Education on November 7, 1991, and delivered to the I.B.M. Education Director on November 19, 1991.

The final document contained two proposals. The first contained a series of five, one-year proposals that provided the Hammonton School District and the I.B.M. Corporation the opportunity to evaluate and reassess their commitment to the partnership on a yearly basis. During the first year, the district's commitment included the purchase of computer hardware and software, if appropriate, from the I.B.M. Corporation, as well as visitation and training sessions for prospective I.B.M. customers. In addition, the project manager or a designee for the district would submit two articles for publication during each year of the partnership, reviewing development of the plan, computer integration and multimedia experiences. The articles would be designed to promote recognition for the district and I.B.M.

I.B.M.'s commitment was designed to provide technical expertise, cabling and wiring for the backbone network, staff development and peripheral hardware such as CD-ROM and videodisc players. In short, the proposal turned into a large-scale matching grant where equal dollar amounts were contributed by each party.

The second component contained the original matching grant proposal. The education director had indicated to the project manager on several occasions that, although he was extremely supportive of the proposal and agreed that it was linear with I.B.M.'s future goals and visions for education, the partnership proposal could be rejected. The project manager realized from the beginning that the chances of rejection were great, and now those chances were increased due to the corporate reorganization rumors. The education director had indicated that he had discretionary "seed" money and could support projects on a much smaller scale. Where Project PACITT addressed a price tag of over $3 million, the matching grants proposal was estimated at approximately $60,000.00. It was included as a contingency in order to continue progress toward the ultimate goal - to acquire hardware and software to bring the plan to fruition.

On December 10, 1991, a meeting was held to discuss the proposal. Present from the district were the superintendent of schools, the school business administrator and the project manager. I.B.M. representatives included the education director, the systems engineer and the marketing representative.

Most of the discussion centered around the reorganization of the I.B.M. Corporation and the creation of EduQuest, the I.B.M. Educational Systems Company. As a result of restructuring, the Mt. Laurel office was dedicated solely as an educational center, thus providing more autonomy and direct contact with EduQuest in Atlanta, Georgia. However, according to the education director, during its first year of operation, Eduquest had informed each center that it would only fund partnerships replicated or extended from the preceding year. New proposals would not be considered.

Although the letdown was obvious, discussion focused on two issues. Project PACITT would be withdrawn. However, depending upon EduQuest's situation and direction, it would be resubmitted in December 1992, for consideration during the 1993-1994 school year. In addition, once the Mt. Laurel office received notification, the matching grant proposal could be separated from Project PACITT and submitted locally for consideration for discretionary funding.

Resubmission of the matching grant proposal was approved by the Board of Education on January 30, 1992, and delivered to EduQuest on February 4, 1992. After several meetings and telephone conversations, the proposal was approved by the local office in April 1992. By June 19, 1992, ten teachers were selected to receive staff development at the EduQuest Training Center for two weeks in August 1992 and to integrate computer technology funded by the grant into the appropriate curricular area or grade level. Three teachers from the elementary and middle schools and four teachers from the high school were selected for participation from 14 teachers returning the locally developed request for proposal.

In order to acquire the necessary hardware and software, seven strategies were developed and initiated during the implementation period. A summary of the attempts to finance the computer integration plan can be seen in Table 4.

Table 4

Summary of Funding Sources for the Computer Integration Plan

Funding Source	School Year	Amount	Staff Affected
District Commitment	91-92	$200,000	According to Plan
	92-93	$200,000	According to Plan
Mini-Grants	91-92	$20,000	HS Home Economics (1) HS Industrial Arts (1) MS English (2) ES Fourth Grade (2)
Reallocation from Textbook and Instructional Supplies Accounts	91-92	Principal's Discretion	According to Plan
	92-93	Principal's Discretion	According to Plan
USDOE Innovation in Education Grant	91-92 (Unsuccessful Application)	$0	
TELS Grant	91-92 (Unsuccessful Application)	$0	
Hammonton Education Foundation	92-93	$10,000	
Project PACITT	92-93	$30,000	HS Teachers (4) MS Teachers (3) ES Teachers (3)

Staff Development

It was realized from the beginning of the project that teachers would be more likely to maintain and assimilate new strategies into the teaching-learning process if they had opportunities to practice after initial exposure, if they received encouragement and feedback during and shortly after their efforts, and if they received continued one-on-one support. It was also realized that commitment, or buy-in, to computer integration would follow staff development rather than precede it. Staff development in computer integration was, therefore, designed to help teachers learn how to use computers, develop skill in computer applications and integration and, finally, help teachers reach a position where they made decisions about the use of computers in the classroom.

Since technology was addressed as part of the curriculum infrastructure in Project Education 2000, and since the intent of the process was to promote long-term district change, staff development in computer integration was viewed as one process leading to change. It was considered essential that staff development in this area align with the other staff development initiatives of the district. These included critical thinking and problem solving applications, cooperative learning and peer coaching.

It was also considered important that staff development components in computer integration addressed teacher behaviors that facilitated change and, eventually, institutionalization. Conscious efforts were made to give teachers enough technological information to arouse interest, but not so much as to overwhelm. Decisions were made to provide clear information about a variety of computer uses to stimulate teachers to dream about curricular possibilities, to encourage collaboration and teamwork, and to offer opportunities for practice and expansion of skills.

To create conditions that maximized the development of computer application and integration skills for teachers throughout the five-year process, a place needed to be created in each school where teachers had the opportunity to sustain practice and receive support. From the beginning of the project, it was decided to include teacher centers at the high school and middle school early in the five-year computer integration plan. To facilitate the teacher training process, to promote collaboration and to provide a non-threatening place for teachers to complete assignments and review software, eight computers were designated for this location at the high school, while five were targeted for the center at the middle school. Centers were based upon a teacher-computer ratio of seven to one.

If full utilization of the teacher centers was to be achieved, they needed to be available to teachers. To accommodate teacher schedules at the high school and middle school, it was decided to open the centers each day of the week that school was in session from 7:30 a.m. until 4:30 p.m. In this way, access would be available before and after the teacher's school day as well as anytime in-between that fit into a teacher's schedule. During the early years of the computer integration plan, follow-up and one-on-one support would be provided in the teacher centers by the supervisor of math and science. As the plan developed and more computers were integrated into the curriculum, it was anticipated that teachers would begin to help each other. It was also anticipated that the mid-range of the plan would be the time to implement a "teacher of teachers" program. The first teacher centers were implemented, according to the plan, at the high school and middle school during the 1991-1992 school year. Each center contained two computers.

The elementary school presented a different challenge. Since the plan targeted six computers for each classroom at the elementary school, creation of a teacher center for practice and software review was not necessary. The problem at the elementary school was how to facilitate collaboration and how to move one-on-one support from classroom to classroom with limited personnel. Since computers were not scheduled for integration into elementary classrooms until the second year of the plan, time was provided to equip the elementary teachers on the technology committee with the necessary skills to help provide one-on-one support. It was also decided to have teachers schedule appointments for individual support with the supervisor of math and science as the computers were integrated into the elementary classrooms.

It was realized that, as more teachers acquired computers, developed skills and became stakeholders, the challenge would be different. At that point, it would become necessary to address ways to provide the element of time for the teachers to collaborate and assist each other. The peer coaching initiative, scheduled for implementation during the 1993-1994 school year, was considered by the project manager a possible solution to fulfill the need.

Beyond the creation of the teacher centers and the provisions for follow-up and one-on-one support, staff development during the implementation period generated from four perspectives. These included: an after-school staff development program in computer applications, a staff development program at the I.B.M. training center in Mt. Laurel, New Jersey, for all K-12 teachers in computer integration and multimedia; dedication of the regularly scheduled inservice sessions during the 1991-1992 school year to computers; and the development of a district continuing education program in computer technology.

In November 1990, a volunteer staff development course in computer applications was initiated. The course, originally open to members of the high school faculty, offered 18 hours of instruction in word processing, spreadsheet analysis and database management. Upon completion of the course, teachers would be awarded one district continuing education credit on the salary guide. The program was designed to include instruction of practical projects that could be integrated into classroom management or instruction. The course was scheduled for nine Tuesdays, November 1990, through January 1991; each session encompassed two hours, 2:30 PM until 4:30 PM. It was taught by the supervisor of math and science.

Prior to implementation of the course, the project manager met with the supervisor of math and science in order to plan areas of concentration for the course. Several components from the computer applications curriculum, developed during the introductory practicum experience, were selected. These included:

Word Processing

1) Typing a document
2) Editing a document
3) Inserting new text
4) Moving text
5) Copying text
6) Saving a document
7) Retrieving a document
8) Printing a document
9) Changing margins
10) Changing line spacing
11) Using a spelling checker
12) Using a thesaurus

Spreadsheet Analysis

1) Identifying spreadsheet components
2) Operating special function keys
3) Arranging columns and rows
4) Naming columns and rows
5) Coordinating cells vertically and horizontally
6) Making entries into cells
7) Saving the spreadsheet
8) Retrieving the spreadsheet
9) Entering labels on the spreadsheet
10) Performing calculations on the spreadsheet

Database Management

1) Planning and designing a database
2) Defining the fields
3) Planning and creating a file structure
4) Entering text
5) Editing text
6) Sorting and indexing files
7) Printing reports and labels

Because the course was limited to 18 hours of instruction, a decision was made not to include keyboarding as an area of concentration.

Time limitations were also established. Eight hours, or four sessions, were devoted to word processing; six hours, or three sessions, were devoted to spreadsheet analysis; and four hours, or two sessions, were devoted to database management. Since the agenda was considered ambitious, and maybe even a bit unrealistic, it was decided that course adjustments would be left to the discretion of the instructor. If teachers wanted or needed extended assistance in a particular area, it could be provided by the instructor.

Eighteen members of the high school faculty volunteered for the course. Represented were the English, social studies, foreign language, math, science, industrial arts, home economics, special education and health and physical education departments. The high school librarian also volunteered to participate.

Through the first four weeks of the staff development course, initial feelings of confusion and frustration had diminished. All components of the word processing section were covered. At each session, teachers were expected to bring materials to class for practice. The supervisor of math and science made every effort to individualize the practice and relate the application of word processing to classroom management and instructional skills. No attempt was made to integrate the writing process into the word processing component, although the six steps of prewriting, writing, discussing, revising, editing and evaluating were discussed.

Although practice was mostly limited to lesson plan and test construction during the word processing component, several teachers ventured out and completed assignments for graduate classes and wrote personal or professional letters. One teacher even developed a newsletter, with columns, of classroom activities and events. The newsletter was disseminated to the students and incorporated into various assignments. It was eventually disseminated to parents.

As the word processing component came to a close, Project Education 2000 was beginning to generate discussion and enthusiasm among teachers in the district. As the computer integration committee had expanded into the technology subcommittee of 'Ed 2000, the question emerged and consideration was given to expanding the opportunities for staff development in computer applications.

In December 1990, a description of the computer applications training program and an invitation to participate were placed into the main offices and faculty rooms of the middle and elementary schools. The description was identical to the course offered for credit at the high school. The course was targeted for implementation from January through March, 1991. Within one week, 52 teachers, 30 teachers representing every departmental area in the middle school and 22 teachers representing every grade level in the elementary school, registered for the course.

The challenges to implement the computer applications course for middle and elementary school staffs were primarily schematic. Although Word Perfect 5.1, Lotus 1-2-3 and d-Base IV were utilized by clerical staff throughout the district, the programs were only available for instructional purposes at the high school. Since these programs would eventually be available for teacher utilization throughout the district, a decision was made by the project manager to conduct the computer applications courses at the high school.

Because of differences in the school day, middle school teachers completed their day at 2:35 p.m. while elementary teachers completed their day at 3:30 p.m., it was decided to divide the sections according to respective schools. Two sections were created for the middle school teachers, while one section was created for the elementary staff. Middle school sections were targeted to start at 2:45 p.m., while elementary sections were targeted to start at 3:40 p.m. Sections were scheduled for different days.

With regard to the middle school sections, it was fortunate that each computer applications course contained 15 teachers. Although teachers were provided a choice of days to attend, a perfect split resulted. In addition to maintaining a one-on-one computer-teacher ratio, class size provided an opportunity for four additional high school teachers to enroll. For various reasons, these teachers, representing the art, music, and social studies departments, had been unable to participate prior to the Christmas holidays. Each had asked the project manager for consideration should additional staff development courses be implemented. With the opportunity, each teacher was anxious for inclusion in the program.

Because of the number of participants, the one-on-one computer-teacher ratio could not be maintained with the elementary school staff. Although the project manager realized that the arrangement was inconsistent with the literature and against the premises under which staff development had originated, it was not considered a major setback. Teachers at the elementary school, as previously mentioned, had virtually no computer experience. Personal concern and anxiety were more the norm than the exception. Comradery, peer support and encouragement were considered important outcomes; in this case, they were considered just as important as the technical skills inherent in computer applications.

Another concern deserves mention. With the other responsibilities of the job, in addition to personal life commitments, it was impossible for the supervisor of math and science to teach three additional staff development courses. Although the supervisor of math and science was willing to accommodate the teachers, the project manager felt that it would be better not to over-utilize and saturate his talents and abilities. The writer was fortunate when, on the first request, one of the high school business teachers responsible for the computer applications course agreed to teach two of the additional sections. She was assigned both sections of computer applications for the middle school staff.

Two weeks after the computer applications courses for the middle and elementary staffs began, the course for the high school teachers was completed. Informal feedback from the participants indicated a great deal of respect for the instructor, an increase in computer awareness and knowledge of computer applications and, most importantly, an appreciation for the role of computers in the teaching-learning process. Overall, the course was rated a success. At this point, the most prevalent comment became a question, "Okay, you got me hooked; what's next?"

Every high school teacher involved in the computer applications course utilized Lotus 1-2-3 to develop a gradebook. During the four-week period, teachers calculated student grades on a weekly basis. Students were also apprised of their marking period averages on a weekly basis. Although the timeframe was short and inconclusive, the project manager made several observations at the conclusion of the experience. After informally talking with 13 of the 18 teachers, it was revealed that students had no incomplete or missed assignments during the period of time that grades were disseminated on a weekly basis. In addition, the teachers indicated that average grades for the class increased during the same period. Perhaps most intriguing though was the point that not one of the teachers had a discipline referral to the office during the four-week period. The anecdotal information was filed for more extensive consideration at a future date.

During the staff development program for high school teachers, the supervisor of math and science and the project manager communicated on almost a daily basis. One change occurred from the original plan. Database management only received one session, or two hours, of instruction. During the last session, the teachers requested instruction in the integration of word processing and spreadsheet files. The final meeting addressed the request of the teachers.

It was interesting that throughout the entire nine-week period, none of the sessions ended on time. The enthusiasm and interest of the teachers extended each session up to 30 minutes. One suggestion for future courses was offered by the supervisor of math and science. It became obvious early in the nine-week course that many of the teachers did not possess a knowledge of the keyboard. Although typing skills were not considered necessary or even important by the project manager for teacher training, it was now recognized that a fundamental knowledge of the keyboard would facilitate skill and knowledge acquisition in computer applications. It was recommended that an introductory course in PC-DOS and keyboard awareness be created and offered to teachers as a prerequisite or supplement to computer applications.

Two additional changes were discussed. The first addressed the time span for the course. Instead of conducting the sessions for 18 hours over 9 weeks, the supervisor of math and science felt that less initial confusion and frustration would occur if the course were condensed to 18 hours over 2 or 3 weeks. In addition, he felt that a teacher's guide with directions and minor trouble shooting would provide follow-up support when teachers spent time with a computer outside of the course. Although the first recommendation needed more time for reflection and discussion, the project manager considered the second recommendation excellent. The supervisor of math and science volunteered to work on the teacher's guide.

At the conclusion of the computer applications course for high school teachers, a follow-up staff development activity was presented. The proposal was explained by the supervisor of math and science at the last session for computer applications and reiterated by the project manager in a follow-up memo. One additional district education credit would be awarded to teachers who integrated one or more components of the computer applications course into their specific curricula.

Integration of the computer applications skills was designed for implementation from February through May 1991. Throughout the implementation period, one-on-one support would be provided by the supervisor of math and science.

Twelve teachers volunteered for the continuing staff development program. Represented were the English, social studies, science, math, home economics and health and physical education departments in addition to the school librarian.

Since the English and social studies curricula included a writing component, the four teachers representing these departments integrated word processing into the teaching-learning process. In both curricula, emphasis was placed upon process and products. During units on Shakespeare and American literature, the English teachers utilized the computer lab as a writing lab. One day each week from February through May 1991, each teacher exchanged classrooms with the accounting teacher who was scheduled in the computer lab during the respective periods. During the first several weeks, each teacher taught basic word processing skills to the students with assistance from teachers in the business department. After the introductory lessons and throughout the duration of the staff development process, each teacher utilized the lab as an application center for term paper, report and journal writing activities. The primary goal of the English teachers was to improve the writing process. Extensive use was made of the editing features of the word processing software.

The social studies teachers exchanged classrooms one day every other week during the four-month period. Although the lab was utilized primarily to enhance the writing process through biographical sketches and short reports, other activities included cooperative, decision-making learning experiences involving 19th century American history. The computer lab was utilized as an extension of the classroom where assignments that originated in the regular classroom or as homework could be produced.

One of the social studies teachers ventured beyond the writing styles described above. In attempting to have her class think and write creatively, students were required to produce 19th century frontier newspapers. Working in small groups, the students researched various aspects of frontier life and wrote appropriate newspaper articles. Using Word Perfect 5.1, the students included feature articles, advice columns, obituaries and classified ads, all accurate to time and setting. Newspapers were shared within the classroom and disseminated to other classes in the social studies department.

Two teachers from the science department integrated computer applications skills into the chemistry curriculum. Both teachers received additional training in Lotus 1-2-3 and extensive one-on-one support from the supervisor of math and science. The teachers developed a spreadsheet for chemical equations and reactions for use during lab experiences. Each teacher had the opportunity to exchange classrooms and utilize the computer lab approximately one time every other week. Under the direction of the teachers, students were guided to add another chemical into a formula or elevate or lower the temperature from a heat source. At each incremental step, students adjusted the equations in the spreadsheet and observed and recorded the reactions. Experiments were replicated, obviously with the correct equations, during the regularly scheduled chemistry lab period.

Perhaps the most ambitious project was originated by two teachers in the math department. Word Perfect 5.1 was integrated into the curriculum. The rationale of the teachers was interesting. The teachers indicated that word processing manipulates words, numbers, symbols and pictures. Mathematics, especially on standardized tests, also involves words, numbers, symbols and pictures. When mathematics concepts were produced with word processing programs, the products promised to be powerful tools for organizing and representing mathematical information.

Both teachers dedicated an enormous amount of time to developing mathematical word problems designed to promote critical thinking, problem solving and applications in algebra. Much of the work was done before and after school hours in the computer lab, although one of the teachers had a compatible computer at home to supplement data entry.

Instead of exchanging a classroom for time in the computer lab, the math teachers designed a different process. Certain periods of computer lab utilization had available space. During several periods of the day, every computer in the lab was not utilized. When these periods matched with one in which the math teacher had an algebra class, arrangements were made where the teacher could send two or four students to the computer lab with appropriate materials. The students, working in pairs, had the opportunity to use the teacher-created discs, solve the problems and complete answers on a corresponding worksheet. The worksheet was returned to the math teacher for evaluation. Although the teachers created over 200 word problems on several discs, students focused specifically on areas of identified need.

During the four-month implementation period, approximately 80% of the students had the opportunity to work with the teacher-developed discs in the computer lab. Although the teachers assigned to the computer lab on a regular basis were extremely cooperative and helpful, the math teachers indicated, as did other teachers in the staff development program, that they did not want to abuse the opportunity. In math, the computer lab experience was "awarded." Several students, who created specific discipline problems in the regular classroom, were not granted the opportunity to work in the computer lab. It must also be mentioned that other students modified their behavior in order to receive the opportunity to work in the lab.

Two teachers from the health and physical education department and the school librarian worked cooperatively on a database project. Near the end of each marking period, students in all levels of health education were required to research and develop a written report in a related area. An oral presentation was also part of the requirement.

With additional training and support from the supervisor of math and science in d-Base IV, the teachers and librarian created a research database of books, periodicals and additional materials contained in the Hammonton High School library. Database materials were collected in two areas, mental health and human sexuality. Each database file contained the following information: subject, title, periodical or source, author, date or copyright, bibliographic information and summary information.

Near the end of the third and fourth marking periods, students utilized the library to gather materials to prepare for the health projects. To facilitate the search, students asked the librarian for the database discs. Once loaded into the computer, students could locate and review sources appropriate for a particular topic. All materials were retrieved from the high school library.

Although the process was considered fundamental, it provided exposure to computerized databases and on-line retrieval services. According to the teachers and librarian, the computerized database helped students locate research documents faster and more effectively and allowed students to determine appropriateness without having to retrieve the materials.

In home economics, the student evaluation process was primarily based upon a portfolio of manually produced projects. The teacher involved in the continuing phase of staff development taught clothing and advanced clothing classes. At the beginning of the computer applications project, the teacher asked the writer if she could expand and refine the electronic gradebook developed during the first inservice program. She felt that the gradebook would be appropriate and could be replicated for all courses in the fine, practical and industrial arts areas.

During the first staff development program, she had spoken with other teachers from her department. Agreement was reached that a generic gradebook could be created with a spreadsheet that met the needs of all teachers in these departmental areas. Although not within the definition of computer integration or the parameters of the staff development program, the proposal had promise for interdisciplinary utilization and addressed the managerial functions of a teacher. Permission was given by the project manager for the teacher to utilize Lotus 1-2-3 and develop an electronic gradebook for fine, practical and industrial arts.

Due to the complexities of the evaluation or grading system utilized by the home economics department, the teacher worked with the supervisor of math and science two days a week for almost nine weeks. The electronic gradebook became operational for the fourth marking period from April through June 1991. On a weekly basis, the teacher entered data into the spreadsheet, calculated a new numeric and alpha grade and after printing personalized reports, disseminated the results to students. The teacher reported an increase in individual conferences and one-on-one support during the implementation period. The teacher also reported that students stopped challenging their grades after receiving a personalized report from a computer printout.

Two related issues deserve mention. Although the home economics teacher developed the spreadsheet, two additional teachers in the fine, practical and industrial arts departments implemented the electronic gradebook during the fourth marking period. Teachers of art and woodshop met weekly with the home economics teacher to enter data, calculate new grades and disseminate the results to students. Both teachers reported the same anecdotal outcomes, namely increases in individual conferences and one-on-one student support.

The high school principal also noticed the electronic gradebook. During the second phase of staff development in computer applications, the principal observed all classes involved in computer integration projects. However, he became particularly fascinated with the individual conferencing and one-on-one support enhanced by the gradebook. In discussion, the principal revealed that all of the teachers involved in the continuing program seemed enthusiastic; he also indicated that several positive comments about the gradebook had been expressed by parents. The high school principal asked the writer if all teachers would have the capacity to generate electronic gradebooks once the computer integration plan was completely implemented. If teachers accepted computer integration, learned computer application skills and worked cooperatively, it could be done.

As the inservice program to integrate computer applications into the various high school curricula progressed, the courses for the middle school and elementary school staffs reached closure. Basically, the same adjustment made for the high school staff was made for the other staffs. Database management only received two hours, or one session, of instruction. The integration of word processing and spreadsheet files was emphasized during the last session. Because neither the middle school nor elementary school had adequate hardware or software, the follow-up staff development program to integrate the application skills into various grade levels or departmental areas could not be attempted.

Seventy-four members of the professional staff participated in the computer applications training programs and received district continuing education credits on the salary scale. Informal feedback indicated that teachers enjoyed the computer, overcame at least some of their fears and felt that they benefitted from the experience. It appeared that all teachers had an increased awareness of the potential uses of computers in the curriculum. Several suggestions also surfaced. Teachers overwhelmingly felt that the scope of the teacher preparation program in computers should be broadened and that teachers should have more opportunities to work cooperatively during instructional and integration activities. More than anything else, however, the teachers wanted to know, "When do we get our computers?"

Perhaps the staff development initiative that created the most impact and broadened the teachers' awareness of the potential uses of computers in the teaching-learning process was the program at the I.B.M. training center in Mt. Laurel, New Jersey. In February 1991, the project manager telephoned the I.B.M. systems engineer to arrange a meeting to discuss the proposal for the school-business partnership. After discussing the proposal and establishing a date for the meeting, the writer shared several of the district's staff development initiatives for computer integration.

Specifically, the project manager asked if the I.B.M. Systems Engineer could make a Linkways presentation, similar to the program delivered to the technology committee, to the high school staff at an inservice program in April 1991. The project manager also asked if I.B.M. would provide curricular software for review and practice. Although tentatively committing to the Linkways presentation was no problem, the I.B.M. systems engineer stated that he would need final approval from the center's director.

Difficulties emerged when the schematics of the program were discussed. The project manager had proposed to divide the high school staff into three groups. Two labs would be utilized for hands-on experiences. The computer lab would address domain or curricular specific software, while the CAD lab would be utilized for multimedia. A classroom would also be utilized for a Linkways demonstration. Formatively, it was planned that groups would move from location to location.

The systems engineer felt that I.B.M. would agree to supply software for the inservice program. After all, if the teachers liked what they saw and felt comfortable with the software during the hands-on experiences, they might consider purchasing it for integration into the curriculum. To the systems engineer, it appeared to be a "win-win" situation for I.B.M.

However, to make a Linkways presentation for a large group, several additional pieces of hardware and an overhead projector were required. I.B.M. policy required a $2500.00 rental fee when the hardware was utilized off-site. Although the fee was considered minor, it was not budgeted, and the project manager was not going to approach the superintendent of schools for funding. As of February 1991, all purchase orders were frozen in an attempt to save money because of a decrease in state revenues for the 1991-1992 school year. The systems engineer indicated that he understood and would talk to his director concerning the inservice program. At the meeting scheduled for March 14, 1991, the staff development program would be discussed.

Two weeks before the meeting, the I.B.M. systems engineer telephoned the project manager. After meeting with his director, it was determined that the Mt. Laurel office did not have the financial or technical resources to accommodate an off-site training program of this magnitude. Although the local office had developed and implemented educational training sessions on many occasions, it had never conducted a program for an entire school population. And, only a few small training sessions had ever been conducted off-site; Hammonton High School's program in February 1990 was the largest session outside the training center. The education director was not optimistic that a training session of this magnitude could be managed. However, if Hammonton wanted the program, plans and costs could be developed.

From the conversation, it was apparent that an inservice program at Hammonton High School would not come to fruition. However, before completing the conversation, the systems engineer asked if the high school administration would be willing to send its teachers to the I.B.M. training center. An entire school staff had never been hosted, but the center had adequate space and the resources to accommodate a large training session. It was agreed that both sides would consider the option and discuss it on March 14, 1991.

Shortly after the telephone conversation, the project manager met with the superintendent of schools, director of curriculum and instruction and the high school principal. Both on-site and off-site staff development programs were discussed. Although an off-site staff development program had never been conducted for an entire school staff, agreement was quickly reached that the possibility was interesting. The I.B.M. training center was in a professional complex and the facilities were excellent. There would be no question that a massive sales pitch would be delivered if I.B.M. agreed to sponsor the inservice program, and the concepts of computer integration and multimedia would be promoted and enhanced. The high school staff would have the opportunity to experience a variety of computer operations. It was decided that if I.B.M. was agreeable, Hammonton High School would implement its staff development program at the training center.

On March 14, 1992, the supervisor of math and science and the project manager met with the I.B.M. systems engineer, the attend a two hour presentation. The project manager met with the superintendent of schools to present an option for the inservice program. Two half-day inservice programs remained in the school year; the program in April, and another in May 1991. All half-day inservice programs were designed for three hours. If the high school teachers agreed, could a compromise be reached? If the high school teachers would commit to a five-hour staff development program at the I.B.M. training center in April 1991, (allowing one hour for travel time), teachers would be released from the responsibility of attending the inservice program in May 1991. With this option, the April 1991, inservice program would be conducted from 1:00 p.m. until 6:00 p.m. On the inservice date in May 1991, the teachers' workday would end at 12:00 p.m. The project manager also considered it important that members of the technology committee had the opportunity to attend the inservice program.

After a brief discussion, the superintendent of schools endorsed the option. However, he suggested the project manager survey the high school teachers. For the option to come to fruition, at least 98% of the staff had to agree. If the percentage was met, those unable to attend because of prior commitments would attend the cooperative learning inservice programs at the middle school in April and May.

By the beginning of the following week, a survey was developed and disseminated to the high school staff. Three days were permitted for its return. Of the 59 teachers at the high school, 57 indicated approval for the staff development option at the I.B.M. training center.

Six members of the technology committee, and teachers at the middle and elementary schools, also agreed to participate. Upon tabulating the response, the project manager telephoned the I.B.M. systems engineer and arranged a meeting at the training center during the following week. The systems engineer was informed of the timeframe for the inservice program and of the number of participants. Counting members of the administrative staff, 68 people would attend the training session. I.B.M. personnel in Mt. Laurel had never attempted a training program of this magnitude.

During the meeting at the I.B.M. training center, the schematics of the inservice program were defined. Sixty-three members of the professional staff would be divided into 4 groups. Administrators would have flexibility to move from location to location as desired. Each group would spend 70 minutes exposed to a particular aspect of computer integration and multimedia. Two computer labs and two presentation classrooms would be utilized during the program. The labs and rooms were in close proximity; a large area was also designated for refreshments. Short intermissions were built into the schedule to separate sessions.

One lab was designated for computer applications. Twenty computers had Word Perfect 5.1, Lotus 1-2-3 and d-Base IV networked and ready for utilization. Because a number of Hammonton teachers had previous exposure with the software, it was decided to utilize an I.B.M. instructor in this lab. For the teachers with no experience, an overview, complemented with hands-on experience, would suffice. For other teachers, the instructor would discuss applicability to the teaching profession. For the number of teachers with prior experience, reinforcement of the skills was considered beneficial.

It was determined from the outset that teachers would be divided into groups by departmental area. When certain departments went into the second computer lab, domain specific software would be available. The second lab contained 20 networked computers and housed almost an entire library of I.B.M. software. Since most of the high school teachers had no experience with computer integration, and since the purpose of the inservice program was initial exposure, no particular attempt was made to differentiate good from bad software. Software evaluation was considered beyond the scope of the inservice program and would be addressed through additional staff development programs. It was intended that teachers would load the software, receive instruction, experiment with the software and collaborate with other members of the department about ways to enhance the teaching-learning process. Teachers would be guided through practice experiences and then provided time to explore the software program and learning activities. Although I.B.M. would provide an instructor for the lab, it was decided that the supervisor of math and science would assist in the computer integration lab.

I.B.M. had appropriate software for every departmental area with the exception of social studies, foreign language and home economics. To accommodate these areas, the supervisor of math and science and the project manager reviewed a number of software catalogs and selected two appropriate software programs for each area. To simplify attainment, all software programs were produced by the same vendor. However, every attempt was made to locate software that maintained linearity with the extended basics. The I.B.M. marketing representative indicated that she would contact the publisher for permission to review the software at the training center and then make arrangements through a local software distributor to secure the software. The systems engineer would ensure its operability for the inservice program.

Two presentations were also discussed. It was decided to provide a Linkways demonstration in one classroom while offering an advanced multimedia introduction in another classroom. For Linkways demonstrations, the I.B.M. representatives preferred to utilize a teacher of social studies from Southern Regional High School in Manahawkin, New Jersey. The project manager agreed with their rationale and considered this acquisition an unexpected prize. An actual classroom lesson would be created utilizing the computer, software, CD-ROM player and audio enhancements. The project manager felt that a teacher presenting a teacher-created multimedia lesson to teachers while simulating a one-computer classroom would enhance buy-in.

The systems engineer also felt that he could secure a multimedia consultant from the I.B.M. Regional Office in Philadelphia to make a presentation. Although segments of the Ulysses project, an I.B.M. produced in-depth multimedia perspective of Alfred Lord Tennyson's poem on the Greek epic hero would be utilized, the project manager wanted something that encompassed all the "bells and whistles" multimedia could offer. It was envisioned that this presentation could present the long-range future, while the Linkways presentation and the hands-on lab experience represented the short-term future.

It was decided to use I.B.M.'s AVC (Audio-Visual Connection) system for the second presentation. Literally, the Hammonton High School staff had the opportunity to view a multimedia project in the making. AVC was part of I.B.M.'s "Ultimedia", a new high level interactive multimedia system of computers and software projects. The systems engineer explained that I.B.M. expected to market "Ultimedia" during the Summer of 1992.

If the multimedia consultant agreed to make a presentation, the systems engineer indicated that the AVC System would include the integration of a computer with built-in CD-ROM and multimedia capacities, CD-ROM and laser videodisc driver, an audio subsystem including digital playback, music synthesis with sound input capabilities, a video card and a optical read/write drive. In short, the possibility of exposing teachers to the cutting edge of technology had excitement although the project manager realized that a quantum technological leap for most of the teachers could be frightening. If the presentation came to fruition, the project manager intended to monitor the project closely.

During the two-week interim between the meeting and inservice program, the I.B.M. marketing representative confirmed all personnel and software acquisitions. The supervisor of math and science traveled, on three occasions, to the I.B.M. Training Center in order to meet with the systems engineer and coordinate all activities for the program. At one meeting, the supervisor of math and science was loaned a digitizing camera to take pictures of teachers and the Hammonton High School facility. After spending one day taking computerized pictures, the camera was returned. The systems engineer created a continual multimedia presentation, personalized for the Hammonton inservice program. On the day of the program, the intention was to run the program in the I.B.M. welcome area as the teachers arrived and during their stay.

On the day before the inservice program, the project manager joined the supervisor of math and science and the systems engineer to review the inservice schematics. The multimedia consultant from the Regional Office was present. By the time the school district representatives arrived, hardware and software components for the presentation were already assembled and integrated. Although flashy, and with all the "bells and whistles" ordered by the project manager, it was not felt that AVC would be as frightening as first expected. The project manager now felt that teachers would find the presentation fascinating but question its reality for implementation in the high school. Nevertheless, Ulysses segments and additional programs exhibited strong connections between education and high technology. The presentation was sure to stimulate creative thoughts in a number of the high school teachers.

On April 10, 1991, the inservice program was conducted. One point may best illustrate the success of the inservice program. At the beginning of the third session, I.B.M.'s education director for the State of New Jersey asked to see the project manager. The meeting was quite unexpected. The two had met on the previous day in order to discuss Project PACITT, and the education director had indicated that he would be out of the office during the day of the inservice program. The director indicated that he made a special attempt to return to the training center. All of I.B.M. Mt. Laurel's staff development previously addressed small group training or presentation. All of his training indicated that training sessions should be small. When the concept of bringing an entire school staff to the training center was proposed by his staff, he was skeptical. In fact, the director indicated that his initial reaction was to say no; it wouldn't work; it was simply too big. However, the systems engineer and marketing representative persisted, and he finally agreed. He stated that, after the meeting to discuss Project PACITT and after witnessing the inservice program in operation, he became convinced that entire school staffs can be accommodated. The education director was surprised that the entire program came to fruition and, most importantly, the teachers obviously had interest, appeared to be learning, and were even having fun. He indicated that he had learned something from the experience and intended to explore expansion of this type of inservice program in the future. A note to this intention deserves mention. According to the marketing representative, the I.B.M. Training Center in Mt. Laurel, New Jersey, has hosted seven inservice programs for entire school or district staffs in addition to Hammonton, as of May 1992.

Within two days of the inservice program, a short feedback instrument was disseminated to the staff. Upon return, the results were tabulated. The Linkways presentation and the hands-on lab for computer integration software received the most positive comments from the staff. The computer applications lab was next, followed by the AVC program. Not one teacher stated disapproval with any of the sessions. Linkways and the curricula specific lab experience were considered more appropriate to the classroom. It was interesting that several teachers commented positively about the professional environment at the I.B.M. training center. The project manager also felt, and confirmed after informal follow-up, that the teachers enjoyed the off-site status of the inservice program.

Several suggestions for improvement were also included on the feedback instruments. Overwhelmingly, the teachers desired more time for hands-on experiences. This was true for teachers considered experienced, as well as inexperienced, with computers. The teachers also suggested more concentrated training with curriculum specific software. Overall, the teachers were extremely satisfied with the program and expressed interest in another session. As two non-experienced computer users stated to the project manager, "It was the best inservice program we've ever had!"

After the feedback results were discussed with the superintendent of schools, the project manager telephoned the systems engineer and the marketing representative. The purpose of the conference call was to share the results of the teachers' feedback and to discuss future directions. While Project PACITT was still in the developmental stages, future staff development programs received focus. The project manager asked if the I.B.M. representatives felt they could accommodate the entire K-8 staffs of the elementary and middle schools in a full-day inservice program. Without hesitation, the response was affirmative. Tentatively, the structure would be similar although the software would be different. I.B.M. had made significant progress in the elementary software market; available programs would not be a problem. In fact, I.B.M. was extremely proud of its elementary learning software and utilized every opportunity to showcase it.

The computer readiness of the staff was more of a concern, especially with regard to Linkways and AVC. The teachers had much less computer experience than the high school teachers. However, both the I.B.M. representatives and the project manager would discuss the inservice proposal at their respective sites. Another communication would occur during the next several weeks.

The full-day inservice date was scheduled for the end of October 1991, during the 1991-1992 school year. When the project manager met with the superintendent of schools and the director of curriculum and instruction, agreement was reached that the magnitude of the inservice program required a full day. One-hundred and six members of the professional staff would be involved. Discussion also revealed that the district would receive the most benefit, with regard to follow-up, if the inservice program were conducted as early as possible in the school year. A half-day inservice day was scheduled for September 25, 1991. A decision was made to switch the dates of the half-day and full-day staff development programs. With the date set, the project manager could proceed with arrangements for the inservice program.

In May 1991, contact was made with the I.B.M. systems engineer. The I.B.M. education director had agreed to host the inservice program for K-8 teachers in the Hammonton School District. The date was set for September 25, 1991. A preliminary meeting was scheduled for July 17, 1991, in order to discuss and review software for the program.

On July 17, 1991, the director of curriculum and instruction and the project manager met with the systems engineer and marketing representative at the training center. Although a decision was made to include Linkways and AVC in the program, the main emphasis would be on Writing to Read (WTR) and Writing to Write (WTW) for kindergarten and first and second grade teachers, Teaching and Learning with Computers (TLC) for the third through sixth grade teachers, and Managing Time and Money for the seventh and eighth grade teachers. In addition, the computer applications lab would also be used for hands-on experience in Word Perfect 5.1, Lotus 1-2-3 and d-Base IV. After a review of the software, it was decided that a fifth session would be added.

Prior to the hands-on experience in the lab with the I.B.M. software, a classroom presentation would be conducted. In other words, before the kindergarten and first and second grade teachers entered the lab for the hands-on experience with WTR and WTW, initial exposure in a classroom setting would be provided. The same would be true for the other groups of teachers with their respective software. Since the software that would be utilized was integrated and aligned from grade to grade, it was considered broader in scope and more complicated than the software utilized by the high school staff. The project manager felt that a classroom presentation, prior to the lab experience, would be beneficial to the teachers and enhance their hands-on participation.

It was decided that a meeting would be held on September 11, 1991. At that time, all arrangements would be finalized. During the interim, the project manager would complete the inservice schematics, while I.B.M. would secure the personnel for each of the sessions. A request was made to utilize, if possible, the same personnel from the previous Linkways and AVC presentations.

On September 11, 1991, the supervisor of math and science and the project manager traveled to the I.B.M. Training Center. The systems engineer and marketing representative had secured the trainers for the inservice program; personnel for Linkways and AVC would remain the same. In addition, the I.B.M. representatives were able to secure instruction for WTR and WTW, TLC and Managing Time and Money. At this point, rooms were available, and hardware and software were ready.

The inservice program would be conducted from 9:30 a.m. until 3:30 p.m. One hour was allowed for lunch; teachers had already received notification that lunch was on their own. Teachers had also been provided with a listing of restaurants in the area. Over 70% of the teachers indicated that they intended to drive to the I.B.M. training center. Each session was designed to last 60 minutes, a short intermission was allowed between sessions. As previously discussed, prior to the hands-on experience in the lab, teachers would receive initial exposure in a classroom presentation.

The supervisor of math and science utilized the digitizing camera one more time to take pictures of the teachers and buildings. Another multimedia presentation, created by the systems engineer, was personalized for the Hammonton inservice program. The process necessitated two additional visits by the supervisor of math and science to the I.B.M. Training Center.

On September 25, 1991, the inservice program for the K-8 teachers was implemented as planned. In accord with the high school inservice program from the previous April, a feedback instrument was disseminated to the staff several days later. Results of the feedback indicated that the teachers preferred the _Linkways_ presentation and hands-on lab experience. However, _Writing to Read_ and _Writing to Write_ received much more support from the kindergarten and first and second grade teachers than either _Teaching and Learning with Computers_ or _Managing Time and Money_ from their respective teachers. Again, the computer applications lab received positive reviews from the staff while AVC followed. Perhaps with the middle and elementary staffs, AVC appeared unrealistic and maybe even inappropriate for education. Several comments indicated that the AVC presentation was fascinating.

Several suggestions for improvement were also included on the feedback instrument. Two recommendations were prominent. Teachers recommended more hands-on experiences during inservice programs. The staffs asked for additional after-school staff development programs that continued the experiences of the I.B.M. inservice program. Teachers also asked for additional instruction in word processing.

Results of the inservice program were discussed with the superintendent of schools. Feedback was also provided for the I.B.M. systems engineer and marketing representative along with several thank-you notes for their effort and support.

While teachers from the elementary school and middle school were at the I.B.M. training center on September 25, 1991, members of the high school staff and the technology committee met at the high school for a continuation of the inservice program from the preceding April. Planning for the program began shortly after that I.B.M. session and was based upon the recommendation of the feedback instrument and the attempt to provide follow-up instruction and support.

In May 1991, members of the technology committee met to discuss the April staff development program and the results of the feedback instrument. Discussion revealed that the inservice program was on-target with the needs of the district. The major task was now continuation. Teachers at the high school wanted to know when they would get computers in their classrooms. The technology committee agreed that the focus of the high school inservice program for September 25, 1991, should primarily provide hands-on experience with Linkways and curricular specific software.

From June through August 1991, the supervisor of math and science and the project manager spent a considerable amount of time scanning software publications, securing appropriate software and reviewing its contents. The superintendent of schools had dedicated a small amount of money for software acquisition for inservice training. Software was targeted that aligned with the extended basics, as defined in Project Education 2000. Specifically, software was identified that promoted and enhanced critical and creative thinking, problem solving and cooperative learning. If software adhered to the extended basics and could also be utilized across various curricula (interdisciplinary), the attempt to secure was made.

Software vendors from throughout the United States were for the most part, extremely cooperative. When telephoning a vendor, the project manager or supervisor of math and science explained that the purpose of the request was to review software for possible inclusion in a staff development program. The school district's plan for the integration of computers throughout the total school curriculum was discussed, as well as the fact that software that met the needs of the teachers and aligned with the curriculum would be considered for purchase.

The most difficult aspect of the task was coordination. Subject area supervisors reviewed and discussed software that was secured with the supervisor of math and science and the project manager. However, supervisors, under contract, were only required to provide ten days of service to the district during the summer. Once the summer schedules of the supervisors were received, the task became one of coordinating the delivery of the software with the work schedule of the supervisor. This, for the most part, was accomplished without incident.

As a result of the efforts to secure and review curricular specific software, site licenses were purchased for the social studies, foreign language, industrial arts, art, music and health departments. I.B.M. again helped immeasurably in Hammonton's attempt to promote computer integration. With assistance from the systems engineer and the marketing representative, Linkways and specific software for the English, science, and mathematics departments were loaned to the district for the inservice program. I.B.M.'s specific curricular software was determined to align with the extended basics.

The major difficulty in planning for the inservice program was schematics. Labs at the high school would be utilized, two multipurpose, networked labs utilized primarily by the business department and the C.A.D. lab in the industrial arts department. The ten networked computers in the media center were also utilized to provide hands-on experience at four locations.

One of the networked labs was dedicated to Linkways while the other was dedicated to curricular specific software. Software for industrial arts, art, and music was loaded into the computers in the C.A.D. lab. Since the computers in the media center were also networked into the file server, access to all software, except that contained in the C.A.D. lab, was permitted.

Three activities were planned for the inservice program. Each group was targeted to receive two hours of instruction and hands-on practice in Linkways and computer integrated software for each departmental area. The supervisor of math and science conducted the Linkways session, while each subject area supervisor conducted the software session for the department. After lunch, teachers had the opportunity to select a third hands-on experience which lasted approximately 90 minutes. Linkways and computer-integration were offered in the afternoon session, as well as Word Perfect 5.1. Word processing was conducted by one of the business teachers in the media center. It was interesting that the entire English department choose to attend the word processing session during the afternoon session.

Feedback concerning the inservice program was extremely positive. Positive comments were received for all of the sessions and for all of the specific curricular software programs except in mathematics. Math teachers indicated that the software did not align with the curricula. The hands-on experience with Linkways received favorable reviews, although many teachers expressed a difficulty working in the abstract. A specific recommendation from many teachers was to offer more explicit training with Linkways. Teachers indicated that they wanted to see how far multimedia software could enhance the curriculum.

Indications were that the teachers appreciated the fact that their recommendations from the April inservice program were addressed. Teachers expressed enjoyment at the opportunity to explore, collaborate and obtain feedback during the developmental software sessions. Most teachers even informally expressed a comfortable feeling with computers. This was considered the most important response by the project manager. A half-day inservice training program was dedicated to computer integration on October 30, 1991. On this date, teachers at the elementary school received instruction in the Josten's Integrated Instruction System. According to the Josten's contract, elementary teachers were entitled to 20 hours of staff development. Since the project manager was not involved in this process, his efforts concentrated solely on the middle school and high school inservice programs.

The attempt was made to focus on the recommendations and interests of the teachers in the English, reading, science, mathematics, social studies and special education departments. The high school business teacher who taught the word processing session in September had received excellent reviews from her peers and was actually requested for the presentation. The session was conducted in the middle school lab. Middle school and high school teachers in the industrial arts, art, music and home economics departments met in the high school C.A.D. lab with their supervisor to align and articulate the software reviewed at the September inservice program with the grade 6-12 curriculum. Since the middle school teachers had not participated in the previous hands-on experience, the supervisor dedicated the first hour and a half of the program to that purpose.

The remainder of the high school staff had the option of continuing the hands-on experience with Linkways or reviewing additional curricular software in the computer lab. Through the process followed in preparation for the September inservice program, additional software was secured for social studies, science, mathematics, health and foreign language. By design, none of the curricular specific software was produced by the I.B.M. corporation. The project manager intended to broaden the scope of the software review process. It was felt that, just as one textbook manufacturer could not accommodate every need and interest of the total school curriculum, software manufacturers had specific strengths and weaknesses with regard to departmental areas.

A suggestion from the high school teachers was eventually included in the inservice program. Although some teachers might desire to spend three hours with either Linkways or specific curriculum software, other teachers enjoyed the hands-on experiences provided for both areas at the last inservice program. Could an arrangement be made where teachers had the opportunity to work on both?

Schematically, two sessions were conducted at the high school. Each session lasted 1 hour and 25 minutes, separated by a 10 minute intermission. Teachers had the opportunity to start in either Linkways or curricular specific software. After the intermission, teachers either returned to the first area or moved to the other option. At the second session, it was recognized that teachers in the lab would be at two different levels. This did occur, however, not to a great extent. Neither the supervisor of math and science or the subject area supervisors were opposed to this situation when asked by the project manager prior to the inservice program.

Feedback from the high school and middle school teachers was again positive. Many of the same comments mentioned previously were restated. Recommendations indicated that a new plateau in learning had been reached. Three suggestions were prominent: continue to do what you are doing; continue to make it relevant and practical for the classroom; and attempt to train and use in-house personnel as much as possible for training.

As the second inservice day for the 1991-1992 school year closed, several things had occurred. Every teacher in the district had experienced initial exposure to computer applications, computer-integrated instruction and multimedia. Over 50% of the teachers had experienced follow-up instruction in each of the areas. Over 50% of the teachers had experienced follow-up instruction and one-on-one support in computer applications. Approximately one-third of the teachers had received additional instruction and one-on-one support in multimedia and computer-integrated instruction.

In addition to staff development and inservice training, the number of computers utilized in the instructional process in the school district had increased, and the district had acquired a small amount of curriculum specific software for the teacher center in the high school. Several teachers also inquired about its availability for classroom utilization. Since classrooms still did not have computers, for the most part, a method needed to be devised that permitted teachers to secure a computer and software for the classroom. Teachers could continue to exchange classrooms with the business teachers scheduled in the computer labs. However, with an increase in software and more teachers expressing an interest, this was not deemed an ideal solution.

Two additional inservice dates remained in the school year, and both had been dedicated to computer-integration prior to the MARP experience. However, an administrative decision by the superintendent of schools in February 1992, re-targeted emphasis of the inservice programs for the remainder of the 1991-1992 school year.

From November 1991, through February 1992, a number of fights and altercations, in many cases racially motivated, occurred in the high school and middle school. Although exaggeration and the negative perception of the climate within the schools far exceeded the actual conditions, a genuine concern emerged from the community and transcended to the board of education. Perceptions and actual school climate were discussed at meetings of the District Management Team, as well as at faculty meetings in both schools. A reality did exist, however, at both schools. Faculty morale had deteriorated to the point where a number of exaggerations were initiated by members of the staff.

After several administrative meetings, including the superintendent of schools and the project manager, a decision was made to focus on school climate, discipline and peer mediation during the remaining inservice programs in March and April 1992. Although outside the parameter of the MARP experience, much of the inservice program design was established by the human resources subcommittee of Project Education 2000. Since the project manager chaired this subcommittee, much of the planning and organizing for the program came under his direction.

Prior to implementation of the inservice programs, the project manager met with the superintendent of schools. At this meeting, the Superintendent's support for the integration of computers and technology was affirmed. Inservice programs for the 1992-1993 school year remained dedicated to computer integration.

One final element of staff development came to fruition. After the staff development programs in computer applications were completed, a number of teachers asked if additional courses would be offered for district continuing education credits. Recommendations were made by teachers on the feedback instrument that was disseminated after several of the inservice programs.

Quite unexpectedly, the computer applications staff development program launched an inservice training program for district continuing education credits. It had proven to be an effective means to move the district in a positive direction. Also, it provided a way for the district to receive an immediate return for its investment. During the Summer of 1991, several courses were offered in critical thinking skills and cooperative learning. Additional courses were offered during the 1991-1992 school year.

In February 1992, computer inservice classes and district continuing education credits were discussed by the technology subcommittee. In an attempt to maintain alignment with the five-year computer plan and the acquisition of district hardware and software, a five-year outline was developed. A ten-course sequence was established. Beginning in the 1992-1993 school year, the district possessed the hardware and software to administer four courses for district continuing education credits: Introduction to MS DOS; Computer Applications; Word Processing; and Spreadsheets. Since word processing and spreadsheets received initial exposure in computer applications, each course was viewed as advanced standing. The committee felt that the first two courses should serve as prerequisites for the latter. Therefore, in order to accommodate members of the professional staff who had participated in the program during the 1990-1991 school year, it was decided to offer the introductory and word processing courses in the fall and the computer application and spreadsheet courses in the spring.

During the 1993-1994 school year, two additional courses would be added to the sequence: Communications; and Graphics. The introductory and computer applications courses would also serve as prerequisites for their inservice programs.

During the 1994-1995 school year, eight courses would be offered for district continuing education credits. Creating Testbanks could be taken after a teacher had completed three courses: Introduction to MS DOS; Computer Applications; and Spreadsheets. Desktop Publishing could also be taken after a teacher had completed three courses: Introduction to MS DOS;

Computer Applications; and Word Processing. Multimedia would be offered during the 1995-1996 school year, while Advanced Multimedia would be offered during the 1996-1997 school year. Both courses required the completion of the first two courses prior to admission; Advanced Multimedia also encompassed Multimedia as a prerequisite.

Although specific course content was not established, each inservice class contained 18 hours of instruction in order to qualify for a district continuing education credit. It was decided that courses would be held after school and would be available either in the fall or spring of each year.

One additional issue was discussed. At this point, only three people in the district had the qualifications to teach courses for the inservice training. Although the supervisor of math and science possessed the skill to teach all ten courses, two teachers in the business department at the high school could only teach Computer Applications, Word Processing and Spreadsheets.

The question was raised by the technology committee. "In order to have on-site trainers for the inservice program, could a sequence of courses be developed to provide trainers for the future?" After discussion, several guidelines were constructed.

1) The trainers would be a resource person for the school-site in addition to a faculty trainer.
2) The trainer would conduct staff development both at the

school-site and district-wide.

3) The trainer could develop different levels of proficiency; that is, each sequence of courses would qualify a trainer to provide different levels of inservice instruction.

4) Trainers would accrue district continuing education credits for classes completed in preparation for inservice instruction.

Although a trainer program would become a challenging aspect of the total staff development program, the benefits would obviously outweigh the drawbacks to implementation. Although the guidelines were formative, they provided a framework to plan for the future.

On May 14, 1992, the Board of Education met at a regularly scheduled meeting. The five-year staff development program in computer studies was unanimously approved for implementation in the 1992-1993 school year. In addition, the trainers' program was presented and discussed. The project manager was authorized by the Board to begin development of a plan to develop trainers and resource personnel for computer technology.

Creation of a Model Classroom

A dream of the project manager included the creation of a Technology Enriched Classroom of Tomorrow. The goal was to create a model classroom of the twenty-first century that would be dedicated solely to staff development and teacher retraining in technology. The classroom would be created in the district by retrofitting an existing classroom to accommodate new technologies. The intention was not to replace the teacher centers at the middle school and high school. They served a different purpose. The Technology Enhanced Classroom of Tomorrow was envisioned to serve as a training center where the role of the teacher was changed from being a transmitter of knowledge to a facilitator of learning. Almost immediately, the classroom was referred to as the TECT Center. When the project manager first discussed the I.B.M. school-business partnership with the technology committee in March 1991, the concept of the TECT Center was discussed. The vision included a TECT Center that would foster a climate to make the district a center for staff development, computer-integration and multimedia. It would be organized around six key teaching-learning strategies that promised to meet the present and the future needs of Hammonton students and teachers: critical and creative thinking; cooperative learning; interdisciplinary instruction; active learning; lifelong learning; and information and knowledge processing.

To develop these strategies under an infrastructure of the extended basics and technology, the TECT Center would be divided into five learning centers. Each learning center would include, at a minimum, two computers, a CD-ROM player, videodisc player, interactive computer software and a digitizing camera. Teachers would be trained not to just use the technology; but to design innovative high tech curricula.

The project manager proposed that the TECT Center offer a variety of inservice programs to meet the professional needs of all district personnel, including professional and support staff. All courses would be free of charge to district employees; courses would be designed to offer district continuing education credits after successful completion. Eventually, the TECT Center would be open to school districts within the Southern New Jersey area. Fees would be charged to cover the cost of training.

With overwhelming support from the technology committee, the writer addressed the dream, over the next several months, with the superintendent of schools and eventually the education committee of the board of education. Although enthusiastic about the vision, realism was established. There was no question that the TECT Center would never come to fruition if the proposal depended upon local funding. A number of school-business partnerships with a variety of technology manufacturers was required.

As of June 30, 1992, the TECT Center has not come to fruition. However, after the project manager disseminated several explanatory letters, a few business and technology manufacturers have expressed interest. In April 1992, the Hammonton Chamber of Commerce indicated its desire to become a partner in the venture. In return for financial contributions from small businesses in the community, the district would offer training and retraining to employees of the businesses in Word Perfect 5.1, Lotus 1-2-3 and d-Base IV in addition to Multimedia technologies. Beyond the technological benefits of the TECT Center, the arrangement would be of great benefit and contribute to the positive feelings and climate that have existed between the school and community.

New Jersey Bell also expressed an interest in the TECT Center. In May 1992, the project manager met with an executive from New Jersey Bell-Atlantic County, to discuss New Jersey Bell's interest in the development of fiber optic cabling in the TECT Center. As of April 1992, the project manager became chairperson of a task force exploring the feasibility of "fibering" the 24 school districts, post-secondary institutions, municipal and county government agencies and several businesses in Atlantic County, New Jersey. The conversation regarding the TECT Center was a side conversation after a meeting concerning the county project. Although New Jersey Bell was in the process of deploying fiber optic "hubs" throughout Atlantic County, the TECT Center presented a different type of project in which the corporation might have interest.

In June 1992, the project manager also met with I.B.M.'s education director concerning the TECT Center. I.B.M. expressed a great deal of interest in the center; in fact, the education director had specifically cited it as an important selling point in the original partnership proposal. As of June 1992, Eduquest's position on partnerships had not changed, only continuing partnerships were funded for 1992-1993. I.B.M. Mt. Laurel did not have the discretionary funds to finance a project of this magnitude. A positive point did emerge from the conversation, however. The education director indicated that a consolidated effort of technology manufacturers might be arranged. If the project manager was willing to do the work, the education director would put together a list of contact personnel in the various companies who might be able to generate support for the TECT Center. It was decided that creation of the TECT Center would receive emphasis during the 1992-1993 school year.

Dissemination of Information

Dissemination of information to the community about the plan to integrate computers throughout the total school curriculum involved four themes. In November 1990, the decision was made to include two prominent members of the business community on the computer integration committee. Selection of these members to the committee provided a means of disseminating information directly to the Chamber of Commerce regarding the technological pursuits of the high school. Each member was also considered a key communicator in the Town of Hammonton.

By having professional and personal contacts with a large number of people, each member had opportunities to disseminate positive information about the computer integration plan throughout the community. As the scope of the MARP experience widened due to Project Education 2000, the dissemination of information also broadened to promote technology from kindergarten through grade 12.

Through the efforts of these technology committee members, the project manager had the opportunity to present the district's plan for computer integration to several civic groups within the community. At the request of the superintendent of schools, Project Education 2000 was also addressed at each civic group presentation.

During the months of March and April 1991, the project manager served as the guest speaker for the Hammonton Chamber of Commerce luncheon and for dinner meetings at the Rotary Club, Lion's Club and Kiwanis Club. Selection of the civic groups was based primarily upon the audiences. Although each of the groups held a prominent place in the Hammonton community, memberships represented a cross-section of citizens.

The message was identical at each of the meetings. The writer attempted to describe the current state of the district with regards to computer technology and outline a proactive direction into the future. Computer integration was described as one aspect of Project Education 2000.

Although the theme dealt, for the most part, with technology, the real message regarded students. In each presentation, the project manager stated that the district's vision for the future was based upon two critical points. First, all children in the district, both presently and in the future, would live the majority of their lives in the twenty-first century. Their adult lives would be a time of ever-accelerating change, enormous complexity and technological evolution. The second point illustrated the theme more directly. Prepared students today will ensure a better Hammonton for tomorrow. There was no question; the project manager played to the emotions of the audience with the latter point. Since most people in the audiences were parents or grandparents and since most Hammonton High School graduates lived their adult lives either in or close to the town, vested interests were realized.

Although each audience asked several questions, informal conversations after the presentations provided insight into the perceptions of members of the community groups. Several members stated that all parents wanted to provide a better life for their children. They also indicated that they were unaware, but excited, that the district was preparing students for this type of future. With regard to the MARP experience, the project manager felt that, as a result of these presentations, a vital group of citizens in the community had an awareness of the potentials for computer technology in the K-12 educational experience and the district's plan to integrate that technology into the total school curriculum.

In February 1991, the project manager was asked by the editor of the Hammonton News, the weekly town newspaper, if he would be interested in writing a bi-weekly article on educational trends. The offer presented an opportunity to write about some of the outcomes of Project Education 2000. In addition to critical thinking skills, cooperative learning, parental influence and support, community volunteerism and the changing role of the teacher in the classroom, the project manager wrote three articles addressing the utilization of education technology. Two of the articles attempted to create an awareness regarding computer integration. One described a classroom of the future (based in part on the TECT Center) while the other addressed the teaching-learning process in a computerized classroom. The third article approached the subject of computer integration differently. The writer dealt directly with the district's plan to integrate computers into the total school curriculum.

Feedback on all of the articles was positive, although the writer received several letters and telephone calls expressing appreciation for the articles on parental influence and the classroom of the future. Several teachers at the high school also indicated that students had commented positively on several of the articles. One thing was apparent: people were reading the articles. Information about education and the school district was reaching the citizens of the community. From a broader perspective, the project manager felt that with all of the education bashing by the media at the state and national level, residents of the community had an opportunity to read something positive about education.

In August 1991, the editor of the newspaper informed the writer that the parent company had mandated the inclusion of several new feature articles. With something new to include, something had to be eliminated. The editor eliminated three features, one on health care, one on law for the layman, and the writer's educational trends. After a great deal of satisfaction and enjoyment, the project manager was disappointed when the article was canceled.

During the Fall of 1991, the Hammonton School News included three articles on the district's attempts to utilize computer technology and integrate computers into the school curriculum. One article was included for each of the three schools in the district. The Hammonton School News was initiated by the superintendent of schools after his arrival in 1987. The newsletter was an attempt to provide the community with factual information about events and activities of the school district. Although the focus was largely on the students, central issues confronting the district, or even the state, were addressed. The newsletter was published quarterly under a public relations contact and disseminated to every home in the Town of Hammonton and the Borough of Folsom.

The article on the high school focused on the addition of the second computer lab, the second year of the computer applications course, the science lab and the CAD lab. The business department was also highlighted for being the first area in the high school to integrate computers into the total departmental curriculum; the media center received attention for its efforts to completely automate the card catalog system; and the two-station teacher center was acknowledged.

The expansion of the lab, the increase in the amount of computer instruction in the cycle program from 25 to 45 days and revisions to the sixth, seventh and eighth grade curriculum to include keyboarding and Microsoft Works received focus in the article on the middle school. Also highlighted were computer integration in the science department and the library network. The middle school article also included an explanation of the "hub" concept and its facilitation of cooperative learning. Cooperative learning had also been addressed in a previous edition of the Hammonton School News.

Implementation of a prescription learning program in the elementary school was adopted by the board of education as one of the three goals required by the state. The focus of the third article described the use of computers in learning reading, language arts and mathematics skills at the elementary school. The article attempted to create an awareness of prescription learning and computer-assisted instruction with the readers.

The program manager felt that the articles in the Hammonton School News achieved the intentions of the original proposal. Implementation of the computer integration plan was beginning its first year. Information about the plan was disseminated to the public, an awareness concerning the current state of the district and the future direction was created, and an initial knowledge base was provided.

The final theme for dissemination of information concerning computer integration involved a parent's and community member's program at the high school. Each year, during the month of March, teachers in the fine, practical and industrial arts sponsored a program in the arts for the parents and interested community members. The purpose was two fold: to highlight and present projects and portfolios of the students and to provide opportunities for participation in the arts. One of the most interesting aspects of the evening was that parents and other community members could participate, make a production and take it home.

In December 1991, the project manager met with the supervisor of fine, practical and industrial arts to discuss the possibility of including the business department in the arts program and moving the presentation to the end of February. The business department was suggested for two reasons. First, the business department was the only area that had totally revised curricula and had integrated computers into the teaching-learning process. And second, teachers in the business department had previously asked the project manager if they could host, or become part of, a program to disseminate information regarding computers to the public. Members of the business department had a great deal of pride in their accomplishments and wanted the opportunity to showcase the program.

After meeting with his staff, the supervisor met with the project manager. Teachers in the art, music, home economics and industrial arts departments had indicated that many of the projects and productions might not be ready for February, 1991. Although the teachers welcomed the business teachers into the program format and wanted to accommodate the project manager, the desire to maintain the March date was strong. Because of the commitment of this program and the genuineness of the teachers' efforts and concerns, the project manager conceded to maintaining the original date. The date was maintained for March 26, 1992.

Arrangements for the arts program were coordinated by the supervisor of fine, practical and industrial arts. These included parent notification, room assignments, programs and refreshments. On March 26, 1992, the sign-in sheet indicated that 347 parents and other members of the community attended the program. Informally, the majority of people in attendance were identified as parents.

With the design of the program, parents and other community members had the opportunity to travel from room to room to view student work. In any classroom, the opportunity existed to view, talk with the teacher or receive instruction in a particular area.

Approximately 150 parents and other community members visited the computer labs throughout the evening. A few of the visitors to the labs simply walked through, however many spent time talking to the teachers in the teacher center between the labs. The most often heard comment indicated the visitors had read and heard about the high school computer labs. This was the opportunity to see them.

Two of the five teachers in the business department conducted instructional sessions in Word Perfect 5.1 during the evening. Thirty-two visitors spent approximately 90 minutes receiving initial exposure to the software.

In accord with the project objective, surveys were available throughout the evening. Participation in the survey was encouraged, however the project manager asked the business teachers not to be overbearing in this regard. After all, the purpose of the evening was enjoyment. The project manager had determined that if an adequate survey response was not obtained, a mailing would be conducted.

Seventy-seven surveys were completed. Of the participants in the survey, 100% indicated that they were parents and currently had children in the Hammonton High School.

Although the project manager did not participate in the planning process, the computer labs at the middle school and the elementary school also received focus during parents night activities in March and April 1992, respectively. Feedback from the building principals revealed a great deal of interest in the computer labs.

One additional area of information dissemination deserves mention. From April through June 1992, a school-business partnership was arranged through the Chamber of Commerce. This idea was conceived by the project manager through several Project Education 2000 committees. Discussion and refinement became the responsibility of the technology committee. Since the high school had state of the art computer labs and utilized the current business standard software, the idea emerged to offer a computer applications program to members of the business community. For 10 weeks, 18 members of the business community, mostly clerical employees, met in the computer lab at the high school one night each week and two hours each night. Community members received initial exposure in Word Perfect 5.1, Lotus 1-2-3 and d-Base IV. Registration for the program was $200.00 for each employee.

Collection of the registration fees opened up opportunities for the high school computer program. Although the instructor of the course was paid $45.00 an hour, the remainder of the funds was placed into an account. The account was opened and placed under the direction of the high school principal although it was specified for utilization by the computer studies department. If additional supplies were needed, the department had a more efficient means to procure materials. Over time, if the account increased, it could become another means to acquire hardware and software for the computer integration plan.

The course was taught by the supervisor of math and science. Informal feedback from the participants was positive. Many of the participants indicated that a knowledge of computer applications was necessary in their workplace. Several small businesses were upgrading software, and this opportunity permitted several employees to acquire the initial knowledge ahead of time. With others, the experience with computer applications would allow them to become a part of the decision-making group with regard to software selection. One person indicated that the skills were necessary in order to advance in her place of employment.

Feedback to the project manager from members of the Chamber of Commerce revealed positive feelings and support for the school district. Replication of the program was planned for October through December 1992.

Summary and Conclusion

On April 30, 1991, elections were held for the Hammonton Board of Education and the yearly budget. Because of the campaign strategies implemented by the superintendent of schools, the incumbents on the board were re-elected, and the budget was approved by the public. This was considered significant, since it eliminated delays in ordering hardware and software. During the first week of May 1991, the project manager received permission from the superintendent of schools to order the hardware. Each principal and subject area supervisor was given permission by the project manager to order software and additional supplies and materials to implement the first year of the computer integration plan.

The next meeting of the Board of Education was held on May 9, 1991. At the meeting, the project manager presented the computer integration plan and described the developmental process. The Hammonton Board of Education unanimously approved the plan for implementation beginning in the 1991-1992 school year.

1) Develop a clear understanding of the purpose of the planning activity;
2) Define the current states of technology in the district;
3) Visualize the desired state of technology in the district;
4) Address the discrepancies between the current and desired states of technology in the district;
5) Identify stakeholders and develop a common agreement on priorities;
6) Identify all resource requirements; and
7) Develop a strategic plan of direction.

Between November 1990, and April 1991, a review of the literature and the discussions during technology committee meetings identified five district-wide goals for computer integration. The goals were designed

1) to improve the teaching-learning process through the maximization of educational technology, primarily through the integration of computers into the K-12 curriculum;
2) to organize computer-integrated instruction and multimedia experiences under an infrastructure of extended basics in education that include critical and creative thinking, problem solving, collaboration and cooperation and self-directed learning (andragogy) through an active learning environment;
3) to utilize computer integration, and in particular, multimedia, to break down and through curricular barriers

and to promote and enhance opportunities for an interdisciplinary teaching-learning process;

4) to support a progressive program of staff development that changes the role of the teacher from being a transmitter of knowledge to becoming a facilitator of learning, ensures professional staff literacy in the application and integration of curricular specific software and develops competency in the use of audiovisual discs, CD-ROM, digitizing cameras, and other innovative technologies, both currently and in the future; and

5) to network one computer, CD-ROM player and videodisc player into every departmental classroom environment within the district (in order to support curricular presentations and interactive lessons and activities) and to network a hub of six computers, CD-ROM players and videodisc players into every elementary classroom and at least one classroom environment for each departmental area within the school district (in order to maximize and enhance cooperative learning, problem solving and simulation experiences).

Between November 1990, and April 1991, the committee also developed the five-year plan for the integration of computers throughout the total school curriculum and the companion staff development plan. The staff development plan encompassed three phases: initial exposure; follow-up training; and one-on-one support. On May 9, 1991, the Hammonton Board of Education unanimously approved the computer integration plan for implementation during the 1991-1992 school year.

At the beginning of the MARP experience, the following terminal objective was also defined by the project manager:

> As a result of a volunteer staff development program emphasizing computer application skills in word processing, spreadsheet analysis and database management, including pilot teachers in all curriculum areas at Hammonton High School, and extending from November 1990, through February 1991, 100% of the teachers enrolled in the program will successfully implement one application in at least one class as measured by formal classroom observations.

The second terminal objective was also achieved as a result of treatments discussed within the project. Teachers from each of the curricular areas, except business, participated in the volunteer staff development program. Although members of the business department did not participate in the program, the project manager recognized that each teacher in this area had participated in prior staff development activities in computer applications; two of the teachers also taught computer applications to students in the regular school curriculum, and the other three members of the department utilized computers in the teaching-learning process.

The first volunteer staff development program was also designed to inaugurate the integration of computer applications into the classroom management tasks of the teacher. During implementation of the training program, 100% of the teachers enrolled in the course completed lesson plans, constructed tests for student assessment and developed an electronic gradebook. Additional classroom management functions were completed with computer applications on a teacher-by-teacher basis. A review of teacher lesson plans and formal observations by the project manager verified achievement of the terminal objective.

Although beyond the scope of the original MARP experience, an identical staff development program was implemented for 52 teachers in the middle and elementary schools. Each curricular area at the middle school was represented, while every grade level, K-5, at the elementary school was also represented. The program was administered from January through March 1991. One hundred percent of the teachers enrolled in the program also completed lesson plans and constructed tests for student assessment. Verification of the results was obtained through informal classroom observation and teacher conferences conducted by the supervisory staff.

The follow-up voluntary staff development program also deserves mention. Conducted from February through May 1991, 12 of 18 teachers involved in the initial program at the high school participated in a follow-up program designed to integrate computer applications into the teaching-learning process. During implementation of the program, one-on-one support was provided by the supervisor of math and science. Lesson plans and both formal and informal observations by the supervisor of math and science and the project manager substantiated that students utilized word processing and/or spreadsheet applications to complete curricular assignments. The follow-up staff development program resulted in the district's first across-the-board attempt to integrate computers into the school curriculum.

The project manager had also defined the following intermediate objective as a result of the MARP experience:

> As a result of a staff development program emphasizing computer application skills and specific domain processes for each curriculum area, including all teachers at Hammonton High School, and comprising six hours of inservice training during the months of April 1991, and May 1991, all responses in Table 1 (p. 20) will be positive for the majority of teachers as measured by a questionnaire.

In order to assess the effectiveness of the inservice training program on changing perceptions and expectations regarding computer technology and education, the questionnaire administered to high school teachers at the beginning of the MARP experience was readministered to teachers at the high school in April 1991. Despite an administrative decision, with teacher support, to administer the complete staff development program in April 1991, responses to the survey supported the conclusion that the objective was obtained (see Table 5).

Table 5

A Comparison of Teacher Responses Regarding Experience, Interest and Educational Perceptions of Computer Technology, from February, 1990, to April, 1991

Questions		Teachers (N=57)	
		% Yes	% No
1.	Do you have any experience working with a computer?	100	0
2.	Do you have any knowledge of computer applications?	100	0
3.	Do you feel uncomfortable with regard to computers and their technology?	4	96
4.	Have you ever used computers either for or in your classroom?	53	47
5.	Do you feel that computers are important enough to warrant consideration for use in the classroom?	100	0
6.	Do you feel that computers could contribute educationally in your classroom?	100	0
7.	If a computer were available in your classroom, would you know how to use it?	88	12
8.	Would you like to know more about computer use and applications for your classroom?	100	0
9.	Would you like to see some staff inservice time delegated to computer use and applications?	100	0

The implementation of the previously defined strategies developed and implemented during the project contributed to the attainment of the objective. The most interesting outcome was the percentage and number of high school teachers using computers either for, or in, the classroom. Prior to implementation of the MARP strategies, 15, or 26%, of the high school teachers indicated utilization. As a result of the inservice programs, 30, or 53%, of the teachers used computers for classroom management functions or in the teaching-learning process. Although the project manager attributed improvement in teacher utilization at the high school to the combined effects of the voluntary and required staff development initiatives, the results revealed that significant progress had been attained toward the integration of computers into the school curriculum. Continued improvement would depend upon the quality of follow-up support and the acquisition of hardware and software.

Significant improvement was also noted by teachers in experience with a computer, knowledge of applications and levels of comfort or reduction in "technophobia." The project manager also attributed these improvements to the combined effects of the voluntary and required staff development programs.

Although beyond the scope of the intermediate objective, the same questionnaire was administered to middle school teachers following the staff development program in September 1991. Although pre- and post-comparisons could not be made, the project manager wanted to receive additional feedback regarding teacher perceptions regarding computer applications and integration. The results of the questionnaire were comparable with those from the high school (see Table 6).

Table 6

Middle School Teacher Responses Regarding Experience, Interest and Educational Perceptions of Computer Technology, September, 1991

	Questions	Teachers (N=34)	
		% Yes	% No
1.	Do you have any experience working with a computer?	100	0
2.	Do you have any knowledge of computer applications?	100	0
3.	Do you feel uncomfortable with regard to computers and their technology?	9	91
4.	Have you ever used computers either for or in your classroom?	88	12
5.	Do you feel that computers are important enough to warrant consideration for use in the classroom?	97	3
6.	Do you feel that computers could contribute educationally in your classroom?	100	0
7.	If a computer were available in your classroom, would you know how to use it?	91	9
8.	Would you like to know more about computer use and applications for your classroom?	100	0
9.	Would you like to see some staff inservice time delegated to computer use and applications?	100	0

The questionnaire was also administered to elementary school teachers following the staff development program in September 1991. One exception was incorporated into the elementary questionnaire. Teachers were instructed to disregard the utilization of computers in the prescription learning lab and focus only upon the classroom situation when considering a response to the fourth question. The reason was apparent. Every teacher in the elementary school already accessed the computer lab one or two times each week. Results of the questionnaire can be seen in Table 7.

Table 7

Elementary School Teacher Responses Regarding Experience, Interest and Educational Perceptions of Computer Technology, September, 1991

	Questions	Teachers (N=63) % Yes	Teachers (N=63) % No
1.	Do you have any experience working with a computer?	100	0
2.	Do you have any knowledge of computer applications?	100	0
3.	Do you feel uncomfortable with regard to computers and their technology?	24	76
4.	Have you ever used computers either for or in your classroom?	35	65
5.	Do you feel that computers are important enough to warrant consideration for use in the classroom?	100	0
6.	Do you feel that computers could contribute educationally in your classroom?	100	0
7.	If a computer were available in your classroom, would you know how to use it?	32	68
8.	Would you like to know more about computer use and applications for your classroom?	100	0
9.	Would you like to see some staff inservice time delegated to computer use and applications?	100	0

Results of the middle and elementary teacher questionnaires deserve mention. The staff development programs initiated during the MARP experience for middle and elementary school teachers supported hands-on experience, expanded knowledge and reduced uncomfortable feelings toward computers. The percentage of teachers with favorable responses paralleled the responses revealed on the high school questionnaire. The project manager felt strongly that the staff development programs implemented in computer applications, computer integration and multimedia had produced the desired outcomes. In addition, 100% of the middle and elementary teachers responded that they would like to know more about classroom computer applications and would like to see more time dedicated to inservice training. The results indicated that the attention and curiosity of the teachers had reached a crest; it now became necessary to provide opportunities for follow-up training and to acquire the hardware and software to implement the computer integration plan.

At the beginning of the MARP experience, the following intermediate objective was also defined by the project manager:

> As a result of four staff development programs during the 1991-1992 school year emphasizing training in computer integration, multimedia applications and software evaluation, and including initial exposure, follow-up training and one-on-one support for implementation into the curriculum, all responses in Table 2 (p. 32) will be positive for the majority of teachers as measured by a questionnaire.

In order to assess the effectiveness of the staff development programs implemented during the 1991-1992 school year, the questionnaire was readministered to high school teachers in February 1992. Responses to the survey supported the conclusion that the objective was somewhat attained (see Table 8).

Table 8

A Comparison of Teacher Responses Regarding Knowledge in Computer Applications, Integration and Technology from June, 1990, to February, 1992

Questions		Teachers (N=59)		
		Yes	No	Not Sure
1.	Can you use computers to support the instructional process in your subject area?	68%	25%	7%
2.	Can you apply computer application software in your subject area?	81%	0%	19%
3.	Are you familiar with electronic textbooks and learning materials in your subject area?	20%	80%	0%
4.	Could you integrate computers and develop educational strategies for problem solving, data collection, information management and decision making in your subject area?	53%	27%	20%
5.	Could you evaluate the effectiveness of computer software for educational purposes in your subject area?	42%	41%	17%
6.	Could you develop student learning activities designed around computer technology in your subject area?	69%	14%	17%
7.	Could you integrate computer instruction from your subject area with other subject areas across the total school curriculum?	20%	65%	15%
8.	Are you familiar with multimedia activities that support classroom instruction including video and laser technologies?	100%	0%	0%
9.	Are you skilled in using productivity tools for your professional and personal use?	46%	54%	0%
10.	Do you have a knowledge of the ethical and human issues related to computers?	31%	62%	7%

When pre- and post-implementation comparisons were made, percentage improvements were achieved on each survey question. However, a positive majority response was only achieved on five of ten questions. The full-day inservice program implemented in September 1991, and the half-day inservice program implemented in October 1991, targeted the continuation and promotion of computer integration. Emphasis was placed upon the utilization of domain specific software and multimedia. Teachers were encouraged to discuss the integration process with their peers. Software that promoted critical thinking, problem solving and cooperative learning was also highlighted and discussed. Questionnaire responses related to these aspects of the staff development programs achieved a positive majority.

When the administrative decision was made in February 1992, to change the focus of the remaining staff development programs for the 1991-1992 school year, the opportunity to target interdisciplinary instruction, electronic textbooks, software evaluation and computer ethics was greatly reduced. Although improvement in the absolute number of positive responses was achieved when pre and post data were compared, the intent of the objective was not realized. The project manager attributed improvement to the number of teachers who participated in the volunteer staff development programs during the 1990-1991 school year and the one-on-one support administered by the supervisor of math and science. Improvements in all of the computer integration concepts contained in the questionnaire would become the focus of staff development during the 1992-1993 school year.

The project manager had defined one additional intermediate objective at the beginning of the MARP experience:

> As a result of a parent's newsletter developed around the theme of computer-integrated instruction and disseminated in the Fall of 1991, and a parent's night program designed to introduce parents and community members with the plan to integrate computers throughout the total school curriculum and implemented in January 1992, all responses will be positive for the majority of parents and community members in attendance as measured by a questionnaire (see Appendix A: 261-263).

In order to assess the effectiveness of the information dissemination strategies, the questionnaire administered to parents in September 1990, was readministered to 77 parents in attendance at the parent's night program. Although the program was implemented in March 1992, for reasons discussed in the project, the intermediate objective was achieved as a result of treatments administered during the implementation period (see Appendix B: 264-266).

When comparisons were made from September 1990, to March 1992, the percentage of parents with positive responses increased on every question in the survey. Several results deserve mention. One hundred percent of the parents responding indicated that computers can positively contribute to the education of all students, that students should graduate with some knowledge of computer technology, and that computers should be utilized to support instruction in each subject area. This last point, in particular, indicated that the solution strategies designed to promote and enhance computer-integrated instruction had succeeded.

Although implementation of the newsletter and parent's night programs contributed greatly to the obtainment of the objective, the project manager also felt that the civic group presentations contributed positive results. A number of prominent citizens in the community attended the functions; the scope of their influence on other citizens of the town could not be underestimated.

The project manager also felt that, as a result of the strategies to disseminate information to the community, the parents and other citizens of the community attending the program possessed a broad, conceptual understanding of the district's plan to integrate computers into the total school curriculum. The number of visitors to the computer labs and the responses of the volunteer participants in the parental survey indicated this to be true. However, the writer realized that the full impact of the treatments would only become known over time. Although 77 respondents indicated a knowledge and understanding of computer integration, it could not be inferred that they represented the views and attitudes of the entire citizenry.

Two possible side effects were also described by the project manager at the beginning of the MARP experience. The first side effect focused on the superintendent of school's condition that computer integration and staff development plans be developed concurrently for the middle and elementary schools. With the promotion of the project manager to a central office position and the initiation of Project Education 2000, both conditions were resolved. Each was absorbed into the implementation strategies of the MARP.

The second side effect came to fruition during the MARP experience. The board of education recognized that as the district acquired additional hardware and software, not only for utilization in the teaching-learning process but for administrative functions as well, and as increasing numbers of both professional and support staff automated to deliver services more effectively and efficiently, a coordination of the district's ability to assimilate technology was necessary.

For the 1991-1992 school year, a new position was created. As of July 1, 1991, the supervisor of math and science assumed responsibilities as the supervisor of educational technology for the district. The board of education formally approved the position in August 1991. However, for the 1991-1992 school year, the duties of both positions were combined into one job description. On June 11, 1992, the board of education formally created two separate and distinct job descriptions, the former supervisor of math and science became the supervisor of educational technology.

Appropriateness and Effectiveness of the Solution Strategies

Two major solution strategies were included in the project: the development of a five-year plan to integrate computers throughout the total school curriculum, and the development and implementation of a staff development plan for teachers in the district. Solution strategies rested upon the following components:

1) creating and organizing a technology committee;
2) providing literature reviews for the committee with regard to computer-integrated instruction and multimedia;
3) planning and organizing site visitations to schools emphasizing computer integration;
4) developing the five-year plan to integrate computers throughout the total school curriculum;
5) acquiring adequate hardware and software;
6) providing initial exposure, follow-up training and one-on-one support for district teachers in computer applications, computer-integrated instruction and multimedia;
7) developing a staff development plan to companion the plan to integrate computers into the total school curriculum;
8) developing initial plans for a Technology Enriched Classroom of Tomorrow; and
9) disseminating information regarding the district's plan to parents and the public.

The solution strategies implemented during the MARP process proved appropriate and effective for problem resolution. The application of these strategies provided a future, technological direction for the Hammonton School

District, developed stakeholders and public support for the movement and equipped teachers in the district with initial skills required for the integration of computers into the curricula.

The plan to integrate computers into the total school curriculum became part of a larger, more comprehensive strategic planning process to address the quality of the total educational program in the district. Project Education 2000 identified the current state of the district, determined a desired state for the district and planned a direction into the twenty-first century. The 'Ed 2000 process identified five major movements and recommended 82 solution strategies during its year-and-a-half implementation period. The initiatives spearheaded major educational change for the district.

1) The role of the teacher will change from being a transmitter of knowledge to becoming a facilitator of learning.
2) An extended basics for learning, including critical and creative thinking, problem solving, collaboration and cooperation, active process learning and interdisciplinary instruction, will emerge to provide an infrastructure of accountability for all curricular areas within the district.
3) Emerging technologies will become the catalyst to maximizing the effectiveness of the teaching-learning

process. Technology will never replace the teacher in the classroom. However it will be incorporated into the teaching-learning process in ways to make it more effective and efficient.

4) Parents and other members of the community will have greater opportunities to utilize schools as a community resource and to contribute to the decision-making process of school governance. Parental involvement will be a key ingredient to school improvement and student achievement.

5) The professional life of the teacher will change from one of isolation, mistrust and competition to one of collegiality, trust and cooperation.

The efforts of the technology committee promised to impact the future pedagogic direction of the district. The committee's work also provided accurate information about the curricular integration of computers and brought the district's technology plan from a state of nonexistence into the information age in only a few short months. However, there can be no question that the inclusion of technology as one of the five major initiatives of Project Education 2000 may have done the most to validate the five-year plan and ensure the future institutionalization of technology. The message became clear: the integration of computers throughout the total school curriculum was important and significant for the teaching-learning process.

Memorable changes also occurred as a result of the MARP experience. In a number of instances, and at all three schools, teachers revealed a revitalization and renewed enthusiasm for teaching after training in computer applications and exposure to domain specific software. The project manager observed a general feeling of excitement and anticipation for computer technology. The most often asked question became, "When do I get a computer in my classroom?"

Contribution of the Project

The project produced a major contribution to the Hammonton School District in that it primarily focused upon the application and integration of computers into the teaching-learning process and established a vision for the future. Although the original intent of the MARP experience was to integrate computers throughout the total high school curriculum, the impact and emphasis of the project reached beyond the high school and included the district as a whole. Hammonton has made the commitment to long-term change in technology.

The project also greatly influenced the district's staff development program. It was clear that, in order to produce long-term change in the classroom that reflected the indications of the literature, staff development became the key ingredient. Initial exposure, follow-up training and one-on-one support have transcended staff development in computer technology and were incorporated as the infrastructure for all of the district's inservice training programs.

In addition to the primary focuses of the MARP experience, the district initiated several peripheral programs to support implementation of the five-year computer plan. For the first time, the district entered the discretionary or competitive grant writing arena, established an education foundation, ventured into a school-business partnership, developed a policy for district continuing education credits and conducted an intensive off-site inservice training program at the I.B.M. training center. Considerable interest was also developed for creation of the Technology Enriched Classroom of Tomorrow.

The success of the MARP was greatly influenced by, and intertwined with, Project Education 2000. Implementation of both projects was simultaneous and consumed over 18 months of literature reviews and analyses, countless meetings and discussions and enormous public relations. On many occasions, the projects became synonymous, and distinction was blurred. At other times, the separation was clear and distinct. Both projects contributed greatly in providing a direction for the Hammonton School District into the twenty-first century.

Chapter 7

Decisions on the Future

Maintain, Modify or Abandon

The project addressed and reflected the current emphasis of the literature with regard to the utilization of computers in the school curriculum. A five-year plan was developed that focused upon the integration of computers throughout the total school district curriculum. Emphasis was placed upon the computer applications components of word processing, spreadsheet analysis and database management, domain specific software and multimedia. Every attempt was made to provide opportunities for members of the professional staff to think about, dream about and discuss the possibilities and potentials of these technologies on the teaching-learning process.

Critical to the acceptance and the institutionalization of the computer integration program was staff development. For any major educational initiative to succeed and ultimately benefit students, staff must become stakeholders in the movement. Teachers, in reality, are the gatekeepers of the curriculum. A comprehensive staff development program companioned the plan to integrate computers into the total school curriculum. The three phases of staff development were followed. These included: initial exposure; follow-up training; and one-on-one support. Because teachers in the district were at varying degrees of computer literacy, different inservice training programs focused on the different phases of staff development. Based upon the results of the teacher surveys reported in Chapter 6, the project manager judged that teacher buy-in had occurred.

The results of the MARP experience should not only be maintained, but promoted and enhanced during the term of the plan, and evaluated and expanded upon in the future. Current advances in hardware and software make it impossible to select common equipment that meets the needs of the district over the five-year period. Although the I.B.M. Model 30-286 computer has been the workhorse of Hammonton's curricular integration, the computer is certain to fall to obsolescence. In March 1992, I.B.M. announced the new Model 25-386SX computer which will carry approximately the same pricetag as the current Model 30-286. The new computer serves as either a stand-alone or in a network, is equipped for multimedia and deserves consideration as a hardware component for the integration plan. Other hardware expansions and upgrades will almost certainly occur, not only from the I.B.M. Corporation but from other manufacturers, as well. These should be evaluated for possible inclusion.

As hardware improves, software also improves and becomes more available. As software becomes more available, the discrepancies between good and bad software become greater. Teachers will need inservice training in software evaluation. Although the staff development program was canceled during the

1991-1992 school year, it has already been planned for inclusion in the 1992-1993 school calendar.

Because of the outcomes of Project Education 2000, it becomes essential that software meets the extended basics criteria to be considered for curriculum integration. Although critical thinking, creative thinking, problem solving, cooperative learning and active learning do not have to be promoted in every software package, and probably will not be at the current time due to the normal lag between hardware and software development, the inclusion of several components enhances its value to the Hammonton plan. Software that can be utilized across-the-curriculum, or interdepartmentally, should also become part of the search process.

In combination with the outcomes of Project Education 2000, the staff development plan in relation to computer integration should be continued and expanded. The courses developed for district continuing education credits should be implemented on schedule, and the trainer's program should be developed and implemented by the 1993-1994 school year. An adequate number of trainers currently exists to implement courses during the 1992-1993 school year. However, a saturation of time, talent and interest will occur after that time if additional staff do not become facilitators.

Adequate resources need to be devoted to the acquisition of hardware and software for the plan to come to fruition.

Although the superintendent of schools committed approximately $200,000.00 a year to the plan, the mini-grant program targeted computer technology, a school-business partnership provided matching funds and an educational foundation was established and raised $11,500.00, the school funding situation in New Jersey has become suspect.

Under the Quality Education Act (QEA) established in 1990, Hammonton's amount of state aid for education has remained the same. Hammonton received the same amount of state aid, dollar for dollar, for 1992-1993 that it received for 1991-1992. When contractual and fixed costs were added to the 1991-1992 budget for the school district, the increase amounted to over $1 million. Two options were available: eliminate personnel and programs; or raise taxes. Through creative fiscal management, the district maintained all personnel for 1992-1993 and attempted a moderate tax increase. However, the budget went down to an overwhelming defeat, and two incumbent Board of Education members lost their bid for re-election. Some of the financial support targeted for the computer integration plan was cut; however, the school-business partnership with I.B.M. Corporation and support from the education foundation will restore funds lost to the budget deficit.

Preliminary figures from the state indicated that the level of funding will remain the same for the 1993-1994 school year. Although contractual settlements have not been finalized for 1993-1994, estimates indicate that the budget will increase by another $1 million. The school district will be faced with another dire situation as the budget process unfolds.

Under these conditions, the challenges to continue implementation of the computer integration plan will be great. During the 1992-1993 school year, efforts should be made to extend the school-business partnership with the I.B.M. Corporation and target competitive grants specific to technology and computer integration. The challenges to continue are great; however, the potential outcomes derived from computer integration far outweigh the obstacles to fruition.

Dissemination of Information about Project Benefits

Due to the collaborative efforts of the technology committee, an informal dissemination of information regarding computer integration occurred throughout the implementation period. Many of the district staff, external to the committee, were exposed to the literature review and engaged in discussion about the positive relationships between computers and the teaching-learning process. Although some resistance from some staff members was evident throughout the MARP experience, it appeared to decrease and minimize time. Dissemination of information within the district occurred through natural curiosity and because of the overall success of the project.

Informal feedback to the writer indicated that the project had established positive communication and contextual change with teachers through the variety of staff development programs offered during the implementation period. Many of the teachers in the middle school and the elementary school have requested the same opportunity for follow-up instruction and one-on-one support in computer applications and multimedia that the high school teachers experienced during the 1991-1992 school year. Teachers throughout the school district have expressed anticipation for the inservice training programs for district continuing education credits. The interest of the staff should be cultivated and enhanced to further the application and integration of computer technology into the curriculum and to provide opportunities for the sharing of new teaching strategies with peers.

Widespread dissemination of information to the public concerning the computer integration plan will be assimilated into the efforts to publicize Project Education 2000. Although much was accomplished to this regard during the 1991-1992 school year, the final report of Project Education 2000 will be disseminated to the board of education and, eventually, to the public in a variety of formats after completion of the implementation strategies. Publicity for Project Education 2000 will occur through a town meeting, production of a 15-minute video and civic group presentations. Other dissemination procedures will also be discussed. With regard to the written document, as of June 30, 1992, five of the seven written sections were completed; the final written document will be available for public inspection as the dissemination process unfolds.

Dissemination of information regarding the five-year computer integration plan and Project Education 2000 has also occurred outside of Hammonton. Two regional high school districts, two K-12 districts, and three K-8 districts have contacted the project manager and arranged visitations to discuss Hammonton's plan to integrate computers into the total school curriculum. All visitations occurred during the 1991-1992 school year.

Information concerning Project Education 2000 was disseminated to the county superintendent of schools. The strategic planning process was mentioned by the county superintendent at a County Roundtable meeting. To date, the project manager has received three inquiries and conducted two presentations for other school districts in Atlantic County. At the request of the Salem, New Jersey, County Superintendent of Schools, a presentation regarding Project Education 2000 is planned for the Fall of 1992.

Because of the writer's involvement in the above projects, the project manager was asked to chair the Atlantic County Consortium for Fiber Optic Technology. In April 1992, the writer chaired the first task force meeting designed to investigate the feasibility of "fibering" public school districts, post secondary institutions, county and municipal offices, county library offices and several businesses in Atlantic County. Although one additional meeting was held, the project manager's responsibilities through the summer months included the development of a strategic planning process, preliminary inquires into a county-wide partnership with New Jersey Bell, public relations and implementation strategies. The task is monumental, however the benefits to education and the teaching-learning process far outweigh the challenges to realization.

Conclusion

The writer does not intend to lead the reader to an assumption that revisions to the project might not be necessary, nor that the success of the MARP experience rest solely with the project manager. As with any process, careful consideration should be given to each and every part of the project that generated the desired outcomes. The contributions, trust and cooperation of the technology committee members were extremely valuable and greatly appreciated by the project manager. The writer is truly indebted to each member. The writer is also greatly indebted to the pledged support and commitment of the superintendent of schools. A special and sincere thank-you is awarded to the supervisor of math and science of the Hammonton Public Schools. Without his loyalty and devotion, many integral parts of the project might not have been realized.

The MARP experience created an exciting and rewarding experience for the school district, and, specifically, for the writer. As a result of the experience, the project manager feels confident in his ability to facilitate a committee and serve as a catalyst for change. The project manager has also greatly expanded his knowledge of computer technology and its application and integration into the teaching-learning process. The processes utilized throughout the MARP experience have proven to be rewarding, not only for the benefits realized by the Hammonton School District, but for their contribution to improving the leadership abilities of the writer.

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Appendices

APPENDIX A

Parent Attitudes Regarding Computer Integration at Hammonton High School, September, 1990

Questions	Parents (N=63)		
	Agree	Disagree	Uncertain
1. Students lacking computer skills will suffer in the job market in the future.	63%	27%	10%
2. Computers can contribute in a positive way to the education of all students.	68%	27%	5%
3. Most students currently feel uncomfortable with regard to computer technology.	24%	44%	32%
4. Most adults in the community could benefit from some computer instruction.	79%	21%	0%
5. Students should graduate from high school with some knowledge of computer technology.	75%	25%	0%
6. All students should be required to take at least one computer course in high school.	76%	24%	0%
7. One of the best instructional techniques to prepare for future life is to integrate computers into the curriculum.	40%	37%	23%

(*table continues*)

APPENDIX A

Parent Attitudes Regarding Computer Integration at Hammonton High School, September, 1990

Questions		Parents (N=63)		
		Agree	Disagree	Uncertain
8.	Emphasis on computers at the high school level should be in a programming area.	48%	44%	8%
9.	The computer should serve as a tool for student productivity.	67%	24%	9%
10.	Computers should be utilized in the high school to support the instruction in each subject area.	71%	16%	13%
11.	Computers in the classroom will allow teachers to give more one-on-one support time to each student.	63%	24%	13%
12.	Computers in the curriculum can play a role in helping address such problems as discipline and attendance.	20%	40%	40%
13.	Students should be aware of some of the possibilities of computers for learning such as multimedia applications, telecommunications, and graphics.	13%	14%	73%
14.	It is important for students to have a knowledge of the ethical issues of computer technology.	51%	16%	33%

(table continues)

APPENDIX A

Parent Attitudes Regarding Computer Integration at Hammonton High School, September, 1990

Questions	Parents (N=63)		
	Agree	Disagree	Uncertain
15. Computer technology is one of the best strategies to improve a student's ability to think.	68%	27%	5%
16. Computer knowledge can contribute to a student's self-confidence.	63%	18%	19%
17. Computers can assist a student in better understanding subject matter.	67%	24%	9%
18. Students could better work with a computer alone as opposed to being part of a cooperative group.	8%	9%	83%
19. Computers will more actively involve students in their own learning.	37%	23%	40%
20. Computer technology is a "fad" that really distracts education away from the "basics."	0%	86%	14%

APPENDIX B

A Comparison of Parent Attitudes Regarding Computer Integration at Hammonton High School from September, 1990, to March, 1992

Questions	Parents (N=77)		
	Agree	Disagree	Uncertain
1. Students lacking computer skills will suffer in the job market in the future.	97%	3%	0%
2. Computers can contribute in a positive way to the education of all students.	100%	0%	0%
3. Most students currently feel uncomfortable with regard to computer technology.	3%	62%	35%
4. Most adults in the community could benefit from some computer instruction.	99%	0%	1%
5. Students should graduate from high school with some knowledge of computer technology.	100%	0%	0%
6. All students should be required to take at least one computer course in high school.	100%	0%	0%
7. One of the best instructional techniques to prepare for future life is to integrate computers into the curriculum.	71%	6%	23%
8. Emphasis on computers at the high school level should be in a programming area.	19%	65%	16%

(table continues)

APPENDIX B

A Comparison of Parent Attitudes Regarding Computer Integration at Hammonton High School from September, 1990, to March, 1992

Questions		Parents (N=77)		
		Agree	Disagree	Uncertain
9.	The computer should serve as a tool for student productivity.	78%	0%	22%
10.	Computers should be utilized in the high school to support the instruction in each subject area.	100%	0%	0%
11.	Computers in the classroom will allow teachers to give more one-on-one support time to each student.	78%	12%	10%
12.	Computers in the curriculum can play a role in helping address such problems as discipline and attendance.	61%	13%	26%
13.	Students should be aware of some of the possibilities of computers for learning such as multimedia applications, telecommunications, and graphics.	78%	3%	19%
14.	It is important for students to have a knowledge of the ethical issues of computer technology.	91%	0%	9%
15.	Computer technology is one of the best strategies to improve a student's ability to think.	70%	12%	18%

(table continues)

APPENDIX B

A Comparison of Parent Attitudes Regarding Computer Integration at Hammonton High School from September, 1990, to March, 1992

Questions		Parents (N=77)		
		Agree	Disagree	Uncertain
16.	Computer knowledge can contribute to a student's self-confidence.	77%	9%	14%
17.	Computers can assist a student in better understanding subject matter.	79%	18%	3%
18.	Students could better work with a computer alone as opposed to being part of a cooperative group.	13%	2%	85%
19.	Computers will more actively involve students in their own learning.	70%	5%	25%
20.	Computer technology is a "fad" that really distracts education away from the "basics."	0%	100%	0%